Notice of Proposed Amendment (NPA)

Regulation- Proposed Changes

CAR-139 Part I

Aerodrome Certifications, Design and Operation

Directorate General of Civil Aviation Regulations

Aviation Safety Regulations Department

Date of Issue: 8/18/2025

Ref: NPA-CRD No: 01 -2025 to RMT.2025-15 to CAR-139 PART I

Date of Issue: 8/18/2025

1. EXPLANATORY NOTE

1.1. General

The Civil Aviation Authority (CAA) has developed this Notice of Proposed Amendment (NPA) to highlight the new revision of CAR-139 PART I. This revision establishes updated measures for the implementation of standards and requirements for **Aerodrome certification, Design and Operation** as stipulated in ICAO Annex 14 Vol I (Amendment 18).

In line with these updates, the regulation has been fully restructured to ensure alignment with ICAO provisions and supporting guidance.

- **Entry to Force Date: 30-Oct-25**
- **Applicability Date:**
  - Aerodrome design, visual aids, and apron management service: **27-Nov-25**
  - Ground handling oversight: **26-Nov-26**
  - Obstacle limitation surfaces (OLS) : **21-Nov-30**

1.2. Reason for Change

There are a number of factors that have determined the need for and timing of this amendment:

- ☒ Any amendment to an Annex of the Chicago Convention or Documents and Manuals based thereon (ICAO SARPs).
- ☐ Any amendment to foreign source regulation, which has been adapted into an Omani Civil Aviation Regulation.
- ☐ Evidence indicating that current requirements may be inadequate to appropriately address an identified safety risk, such as:
  - ☐Outcomes of a safety risk management for new Hazards,
  - ☐ Current safety risk controls are not adequately effective,
  - ☐Elimination of safety risks for which the Regulation was designed;
- ☐ Petitions from any interested party or requests from industry stakeholders.
- ☐ Any other reason to be specified by the Directorate General of Civil Aviation Regulation.
  - ☐New technology or scientific data;
  - ☐Required reviews;
  - ☐Statutory mandates;
  - ☐Lawsuits
  - ☐Recommendations from other external agencies/government bodies;
  - ☐Other operational and environmental demands;

☐When it is no longer relevant, applicable or effective

1.3. Description of Changes

- **Key Changes in Edition 09:**
  - **Aerodrome Design**: Resolves inconsistencies in runway strip width requirements for Code 3 non-instrument (NINST) runways; this change allows to apply uniform criteria and enhances safety margins for operations at aerodromes with Code 2 infrastructure intending to support Code 3-level operations.
  - **Visual Aids**: Introduces Runway Distance Remaining Signs (RDRS), clarifies threshold marking requirements, harmonizes lighting standards for CAT II operations, and defines indicators for temporary runway closures; these measures enhance pilot situational awareness, particularly in low-visibility or temporary configuration scenarios.
  - **Ground Handling & Apron Management**: Establish foundational SARPs for oversight of ground handling operations, addressing a critical gap in regulatory frameworks; encourages apron management service providers to incorporate ground handling safety into aircraft stand maneuvering protocols, improving turnaround safety and efficiency.
  - **Obstacle Limitation Surfaces (OLS)**: Replaces prescriptive surface design with a performance-based model by introducing two surface categories — Obstacle Free Surfaces (OFS) and Obstacle Evaluation Surfaces (OES); this modern approach provides flexibility to tailor obstacle safeguarding based on actual operational needs, balancing aviation safety with land-use planning.
    - Repeal chapters 11, 12, and 13 and their respective provisions will be incorporated into other Civil Aviation Regulations.
    - Enhancing various administrative and technical aspects.

2. Notice of Proposed Amendment (NPA) – Public Consultation

In order to ensure broad engagement and gather relevant feedback, this **Notice of Proposed Amendment (NPA)** is hereby issued for consultation to Oman Airports Management Company, Occidental Mukhaizna LLC, Transom Handling and Jetex.

- A **Comment Form** is included with the consultation details and must be completed and submitted to:
  - **Mail:** Safety Regulation Department (SRD)
  - **Attn:** Acting Director General for Civil Aviation Regulation
  - **Email:** Safety.Regulations@caa.gov.om
- **Consultation Timeline:**

- **Consultation Period:** 14 calendar days
- **Effective Start Date:** 08/18/2025
- **Closing Date for Comments:** 09/01/2025

- ***Important:***
  - Comments must be submitted **using the prescribed Comment Form**.
  - Submissions received **after the closing date** or **not in the prescribed format** may not be considered.

3. Comment Response Document (CRD)

- All comments received during the consultation period will be formally reviewed by RWG and relevant Department.
- Responses to all comments will be compiled in a **Comment Response Document (CRD)**.
- The **CRD** will detail:
  - The comments received,
  - CAA responses and justifications,
  - Any revisions made to the proposed regulation text as a result of stakeholder input.
- The CRD may also include a list of all persons and/or organisations that provided comments, in line with transparency and consultation best practices.

Rawya Nasser Hamed Al-Adawi

Aviation Safety Regulations Department Director

- Attached Notice of Proposed Amendment
- Attached Comment Response Document

Attached Notice of Proposed Amendment

CAR-139 PART I
Aerodrome Certifications, Design and Operation

- *CAR-139 PART I **Aerodrome Certifications, Design and Operation** (Draft) attached:*

Notes on the presentation of the amendment to CAR-139 PART I.

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~**Text to be deleted is shown with a line through it.**~~	**text to be deleted**
New text to be inserted is highlighted in grey shading.	**new text to be inserted**
~~**Text to be deleted is shown with a line through it**~~ **followed by the replacement text which is highlighted in grey shading.**	**new text to replace existing text**

Note: *This presentation method may not be applied where amendments exceed **40% revision of the regulation**, in which case a fully reissued consolidated draft regulation is provided.*

TEXT OF AMENDMENT

TO THE CAR-139 PART 1

AERODROME CERTIFICATIONS, DESIGN, AND OPERATION

1.1Definitions

~~**Aerodrome Post Holder.** Those positions required as part of the Aerodrome Certification process and identified in Chapter 11, 11.17.18 are subject to approval by the Authority.~~

This definition has been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

Ground handling. Services necessary for an aircraft's arrival at, and departure from, an airport, other than air traffic services.

1.4Certification of aerodromes

1.4.5 The regulatory framework ~~for~~ governing Aerodrome Certification is ~~given in Chapter 11~~ outlined in a different Civil Aviation Regulation (CAR).

~~**1.4.6** Content and general guidelines for the preparation of~~ Particulars to be included in an ~~the~~ aerodrome manual are ~~given in Chapter 12~~ outlined in a different Civil Aviation Regulation (CAR).

1.12 Aeroplane Design Group (Applicable as of 21 November 2030)

Note: *The intent of the Aeroplane Design Group (ADG) is to provide a method for interrelating the specifications for the management of obstacles around aerodromes. The ADG utilizes two criteria related to the aeroplane performance characteristics and dimensions. The first criterion is based on the indicated airspeed of the aircraft at threshold and the second criterion on the aeroplane wingspan.*

See Chapter 4 on the application of ADG for the provisions of obstacle restriction and removal.

1.12.1 An ADG shall be determined for each runway in accordance with the characteristics of the critical aeroplane for which the runway is intended.

1.12.2 The ADG shall be determined from Table 1-2, by selecting the ADG corresponding to the highest values of indicated airspeed at threshold and wingspan of the aeroplanes for which the runway is intended.

Note: *Indicated airspeed at threshold (Vat) is equal to the stall speed Vso multiplied by 1.3, or stall speed Vs1g multiplied by 1.23 in the landing configuration at the maximum certificated landing mass. If both Vso and Vs1g are available, the higher resulting Vat applies.*

Table 1-2. Aeroplane Design Group
(see 1.12.2)
(Applicable as of 21 November 2030)

Aeroplane Design Group	Indicated airspeed at threshold		Wingspan
I	Less than 169 km/h (91 kt)	and	Up to but not including 24 m
IIA	Less than 169 km/h (91 kt)	and	24 m up to but not including 36 m
IIB	169 km/h (91 kt) up to but not including 224 km/h (121 kt)	and	Up to but not including 36 m
IIC	224 km/h (121 kt) up to but not including 307 km/h (166 kt)	and	Up to but not including 36 m
III	Less than 307 km/h (166 kt)	and	36 m up to but not including 52 m
IV	Less than 307 km/h (166 kt)	and	52 m up to but not including 65 m
V	Less than 307 km/h (166 kt)	and	65 m up to but not including 80 m

Note 1: *Detailed specifications concerning the application of the aeroplane design group are given in the* Airport Services Manual, *Part 6* — Control of Obstacles *(Doc 9137).*

Note 2: *The following examples illustrate how the ADG is determined.*

Example 1: If the critical aeroplane that the runway is intended to serve has an indicated airspeed at threshold of 161 km/h (87 kt) and a wingspan of 20 m, then the aeroplane design group would be I.

Example 2: If the critical aeroplane that the runway is intended to serve has an indicated airspeed at threshold of 224 km/h (121 kt) and a wingspan of 52 m, then the aeroplane design group would be IV.

Chapter 3: Physical characteristics

Width of runway strips

1.4.5 A strip including a non- instrument runway shall extend on each side of the center line of the runway and its extended center line throughout the length of the strip, to a distance of at least:

- 75 m where the code number is ~~3 or~~ 4;
- 55 m where the code number is 3;
- 40 m where the code number is 2; and
- 30 m where the code number is 1.

3.4.9 That portion of a strip of a non-instrument runway within a distance of at least:

- 75 m where the code number is ~~3 or~~ 4;
- 55 m where the code number is 3;
- 40 m where the code number is 2; and
- 30 m where the code number is 1.

3.4.18 That portion of a strip containing a non-instrument runway within a distance of at least:

- 75 m where the code number is ~~3 or~~ 4;
- 40 m where the code number is 2; and
- 30 m where the code number is 1.

Table 3-1 Taxiway minimum separation distances

Code letter	Distance between taxiway center line and runway center line (metres)								Taxiway center line to taxiway center line (metres)	Taxiway, other than aircraft stand taxilane, center line to object (metres)	Aircraft stand taxilane center line to aircraft stand taxilane center line (metres)	Aircraft stand taxilane center line to object (metres)
	Instrument runways Code number				Non-instrument runways Code number							
	1	2	3	4	1	2	3	4				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	77.5	77.5	-	-	37.5	47.5	-	-	23	15.5	19.5	12
B	82	82	152	-	42	52	~~87~~ 67	-	32	20	28.5	16.5
C	88	88	158	-	48	58	~~93~~ 73	93	44	26	40.5	22.5
D	-	-	166	176	-	-	~~101~~ 81	101	63	37	59.5	33.5
E	-	-	172.5	172.5	-	-	~~107.5~~ 87.5	107.5	76	43.5	72.5	40
F	-	-	180	180	-	-	~~115~~ 95	115	91	51	87.5	47.5

Grading of taxiway strips

3.11.4 The center portion of a taxiway strip shall provide a graded area to a distance from the center line of the taxiway of not less than that given by the following tabulation:

- 10.25 m where the OMGWS is up to but not including 4.5 m;
- 11 m where the OMGWS is 4.5 m up to but not including 6 m;
- 12.50 m where the OMGWS is 6 m up to but not including 9 m;
- ~~18.50~~ 17 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is D;
- 19 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is E;

- 22 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is F.

3.12 Holding bays, runway-holding positions, intermediate holding positions and road-holding positions

3.12.9 Until 20 November 2030, the location of a runway-holding position established in accordance with 3.12.3 shall be such that a holding aircraft or vehicle will not infringe the obstacle free zone, approach surface, take-off climb surface or ILS/MLS critical/ sensitive area or interfere with the operation of radio navigation aids.

3.12.10 As of 21 November 2030, the location of a runway-holding position established in accordance with 3.12.3 shall be such that a holding aircraft or vehicle will not infringe the inner approach surface, inner transitional surfaces, balked landing surface, approach surface, take-off climb surface or ILS/MLS critical/sensitive area or interfere with the operation of other radio navigation aids.

Table 3-2 Minimum distance from the runway center line to a holding bay, runway-holding position or road-holding position

	Code Number			
Type of runway	**1**	**2**	**3**	**4**
Non-instrument	30 m	40 m	~~75 m~~ 55 m	75 m
Non-precision approach	40 m	40 m	75 m	75 m
Precision approach category I	60 m (b)	60 m (b)	90 m (a, b)	90 m (a, b)
Precision approach categories II and III	-	-	90 m (a, b)	90 m (a, b)
Take-off runway	30 m	40 m	~~75 m~~ 55 m	75 m

a. If a holding bay, runway-holding position or road-holding position is at a lower elevation compared to the threshold, the distance Shall be decreased 5 m for every metre the bay or holding position is lower than the threshold, contingent upon not infringing the inner transitional surface.

b. This distance may need to be increased to avoid interference with radio navigation aids, particularly the glide path and localizer facilities. Information on critical and sensitive areas of ILS and MLS is contained in Annex 10, Volume I, Attachments C and G, respectively (see also 3.12.6).

Note 1: *The distance of 90 m for code number 3 or 4 is based on an aircraft with a tail height of 20 m, a distance from the nose to the highest part of the tail of 52.7 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway center line, being clear of the obstacle free zone and not accountable for the calculation of OCA/H.*

Note 2: *The distance of 60 m for code number 2 is based on an aircraft with a tail height of 8 m, a distance from the nose to the highest part of the tail of 24.6 m and a nose height of 5.2*

m holding at an angle of 45° or more with respect to the runway center line, being clear of the obstacle free zone.

Note 3: *For code number 4 where the width of the inner edge of the inner approach surface is more than 120 m, a distance greater than 90 m may be necessary to ensure that a holding aircraft is clear of the obstacle free zone. For example, a distance of 100 m is based on an aircraft with a tail height of 24 m, a distance from the nose to the highest part of the tail of 62.2 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway center line, being clear of the obstacle free zone.*

3.13 Aprons

3.13.2 The design of aprons shall take into consideration criteria for safe ground handling, including:

a) sufficient space between aircraft stands to enable personnel and equipment to move safely and
b) efficiently;
c) adequate apron markings, apron signs and apron floodlighting;
d) adequate staging and storage areas for ground support equipment (GSE);
e) positioning of fixed ground services;
f) storage areas for unit load devices (ULD);
g) adequate access and egress routes for fuel, GSE and emergency vehicles;
h) clearly delineated and visible access and egress routes for passengers;
i) new technologies (electric charging points, autonomous vehicles, etc.);
j) avoidance of rear of aircraft stand service roads wherever practicable; and
k) appropriate protection for persons, equipment and infrastructure from jet blast and propeller wash.

Note: *Further guidance on apron design and markings is given in the Aerodrome Design Manual (Doc 9157), Part 4 — Visual Aids, and the Airport Planning Manual (Doc 9184), Part 1— Master Planning.*

Size of aprons

3.13.3 The total apron area shall be adequate to permit safe and expeditious handling of the aerodrome traffic at its maximum anticipated density.

Clearance distances on aircraft stands

a) Between the terminal, including any fixed passenger boarding bridge, and the nose of an aircraft; and

Chapter 4: Obstacle Restriction and Removal (Applicable until 20 November 2030)

All construction within the OLS shall have prior approval from CAA prior to design, construction, and implementation.

Table 4-1. Dimensions and slopes of obstacle limitation surfaces — Approach runways

APPROCH RUNWYS										
RUNWAY CLASSIFICATION										
	Non-instrument Code number				Non- Precision approach Code number			Precision approach category I Code number		II or III Code number
Surface and dimensions (a) (1)	1 (2)	2 (3)	3 (4)	4 (5)	1 ,2 (6)	3 (7)	4 (8)	1,2 (9)	3,4 (10)	3,4 (11)
CONICAL Slope Height	5% 35 m	5% 55 m	5% 75 m	5% 100 m	5% 60 m	5% 75 m	5% 100 m	5% 60 m	5% 100 m	5% 100 m
INNER HORIZONTAL Slope Radius	45 m 2000 m	45 m 2500 m	45 m 4000m	45 m 4000 m	45 m 3500 m	45 m 4000 m	45 m 4000 m	45 m 3500 m	45 m 4000 m	45 m 4000 m
INNER APPROACH Width Distance from threshold Length Slope	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	90 m 60 m 900 m 2.5%	120 m(e) 60 m 900 m 2.5%	120 m(e) 60 m 900 m 2.5%
APPROACH Length of inner edge Distance from threshold Divergence (each side)	60 m 30 m 10%	80 m 60 m 10%	~~150 m~~ 110m 60 m 10%	150 m 60 m 10%	140 m 60 m 15%	280 m 60 m 15%	280 m 60 m 15%	140 m 60 m 15%	280 m 60 m 15%	280 m 60 m 15%
First section Length Slope	1600 m 5%	2500 m 4%	3000 m 3.33%	3000 m 2.5 %	2500 m 3.33%	3000 m 2%	3000 m 2%	3000 m 2.5%	3000 m 2%	3000 m 2%
Second section Length Slope	- -	- -	- -	- -	- -	3600m(b) 2.5%	3600m(b) 2.5%	1200m(b) 3%	3600m(b) 2.5%	3600m(b) 2.5%
HORIZONTAL SECTION length Total length	- -	- -	- -	- -	- -	8400m(b) 15000 m	8400m(b) 15000 m	- 15000 m	8400m(b) 15000 m	8400m(b) 15000 m
TRANSITIONAL Slope	20%	20%	20%	14.3%	20%	14.3%	14.3%	14.3%	14.3%	14.3%
INNER TRANSITIONAL Slope	-	-	-	-	-	-	-	40%	33.3%	33.%
BALKED LANDING SURFACE Length of inner edge Distance from threshold Divergence (each side) Slope	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	90 m C 10% 4%	120 m(e) 1800(d) 10% 3.33%	120 m(e) 1800(d) 10% 3.33%

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see 4.2.9 or 4.2.17).
c. Distance to the end of strip
d. Or end of runway whichever is less.

e. Where the code letter is F (Table 1-1), the width is increased to 140 m except for those aerodromes that accommodate a code letter F aeroplane equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.

Note: *See Circulars 301, —345 and Chapter 4 of the PANS-Aerodromes, Part I (Doc 9981) for further information.*

Chapter 4: Obstacle Restriction and Removal (Application as of 21 November 2030)

Note 1: *This chapter describes the management of obstacles within the aerodrome boundary and in its vicinity. The following specifications allow States to define the airspace around aerodromes to be maintained free from obstacles and the airspace where flexibility can be applied in managing the obstacle environment. This permits the existing and intended aeroplane operations at the aerodromes to be conducted safely and prevent the aerodromes from becoming restricted and eventually unusable by the growth of obstacles.*

This is achieved by establishing obstacle limitation surfaces (OLS) consisting of obstacle free surfaces (OFS) and obstacle evaluation surfaces (OES).

Note 2: *The lateral and vertical extent of the OLS are being used in defining the requirements for the collection of terrain and obstacle data sets. Provisions on terrain and obstacle data sets are contained in Annex 15 — Aeronautical Information Services, Chapter 5.*

Note 3: *The establishment of, and requirements for, an obstacle protection surface for visual approach slope indicator systems are specified in Chapter 5, 5.3.5.31 to 5.3.5.35.*

All construction within the (OLS) shall have prior approval from CAA prior to design, construction, and implementation.

The establishment of the required (OLS) is carried out by the CAA.

4.1 General

4.1.1 The Civil Aviation Authority shall establish a process to prevent the growth of obstacles, both fixed and mobile, that may affect the safety or regularity of flight operations at an aerodrome.

Note 1: *Specifications concerning the process to be established by the State are contained in PANS-Aerodromes (Doc 9981), Part II, Chapter 10.*

Note 2: *Taxiing aircraft, aircraft on tow and traversing vehicles are considered mobile objects*

whereas buildings, parked aircraft and vehicles are considered fixed objects.

4.2 Obstacle free surfaces (OFS)

Note: *The purpose of the obstacle free surfaces is to establish airspace that preserves the accessibility of the aerodrome and the safety of operations by protecting aeroplanes during approaches and go-arounds.*

4.2.1 Approach surface

Note 1: *The purpose of the approach surface is to establish the airspace to be maintained free from obstacles to protect an aeroplane in the visual phase of the approach-to-land manoeuvres following a standard 3.0° approach. See Figure 4-1.*

4.2.1.1 Description. An inclined surface preceding the threshold.

4.2.1.2 Characteristics. The limits of the approach surface shall comprise:

a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;
b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway; and

c) an outer edge parallel to the inner edge.

4.2.1.3 The surface mentioned in 4.2.1.2 shall be varied when lateral offset, angular offset or curved approaches are utilized; two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, angular offset or curved ground track.

4.2.1.4 The elevation of the inner edge shall be equal to the elevation of the midpoint of the threshold.

4.2.1.5 The slope of the approach surface shall be measured:

a) when straight-in approaches are utilized — in the vertical plane containing the centre line of the runway and its extension; and

b) when lateral offset, angular offset or curved approaches are utilized — along any straight part of the approach, in the vertical plane containing the centre line of the lateral offset, angular offset or curved ground track or, along any curved part of the approach, in the vertical plane tangent with the curved ground track.

4.2.1.6 Except where the approach surface is raised to comply with approach angles greater than 3.0°, the slope of the approach surface shall not be greater than, and their other

dimensions not less than, those specified in Table 4-1 for non-instrument runways and Table 4-2 for instrument runways.

4.2.1.7 The slope of the approach surface shall not be increased to facilitate the growth of obstacles.

Note: *The slope of the approach surface is intended to adapt to approach operations that have a slope higher than 3.0°. Specifications concerning the modification of the approach surface are contained in* PANS-Aerodromes *(Doc 9981), Part II, Chapter 10.*

4.2.1.8 Where the approach angle is lower than 3.0°, the slope of the approach surface shall be decreased.

4.2.1.9 Where the slope of the obstacle protection surface of a visual approach slope indicator system is lower than that indicated in Table 4-1 and Table 4-2, the slope of the approach surface shall be decreased to match that of the obstacle protection surface.

Note: *See Chapter 5, 5.3.5 on the obstacle protection surface.*

4.2.1.10 Where the slope of the approach surface is reduced, corresponding adjustment in the length of the approach surface shall be made to provide protection to a height equal to that reached with the slopes and lengths in Table 4-1 and Table 4-2.

4.2.1.11 On instrument approach runways, where the obstacle clearance height is higher than 150 m (500 ft) above the threshold, the length of the approach surface shall not be less than:

a) the value indicated in Table 4-2; or

b) that necessary to reach the obstacle clearance height;

whichever is greater.

Table 4-1. Dimensions and slopes of approach surface — Non-instrument runways

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m
Length of inner edge	60 m[a b]	80 m[c d]	100 m[d]	125 m	135 m	150 m
Divergence	10 %	10 %	10 %	10 %	10 %	10 %
Length	1 600 m[e]	2 500 m[e]	2 500 m[e]	2 500 m[e]	2 500 m[e]	2 500 m[e]
Slope	5 %[f]	4 %[f]	3.33 %[f]	3.33 %[f]	3.33 %[f]	3.33 %[f]

[a] Where runway width is above 23 m and up to 30 m, the length of inner edge is increased to 80 m.
[b] Where runway width is above 30 m, the length of inner edge is increased to 100 m.
[c] Where runway width is above 30 m and up to 45 m, the length of inner edge is increased to 100 m.
[d] Where runway width is above 45 m, the length of inner edge is increased to 110 m.
[e] See 4.2.1.10.
[f] See 4.2.1.8 and 4.2.1.9.

Table 4-2. Dimensions and slopes of approach surface — Instrument runways

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Distance from threshold	60 m	60 m	60 m	60 m	60 m	60 m
Length of inner edge	110 m[a]	125 m[b]	155 m[c]	175 m	185 m	200 m
Divergence	10%	10%	10%	10%	10%	10%
Length	4 500 m[d]	4 500 m[d]	4 500 m[d]	4 500 m[d]	4 500 m[d]	4 500 m[d]
Slope	3.33%[e]	3.33%[e]	3.33%[e]	3.33%[e]	3.33%[e]	3.33%[e]

[a] When the runway width is above 30 m, the length of inner edge is increased to 125 m.
[b] When the runway width is above 30 m, the length of inner edge is increased to 140 m.
[c] When the runway width is 30 m or less, the length of inner edge is decreased to 140 m.
[d] See 4.2.1.10 and 4.2.1.11.
[e] See 4.2.1.8 and 4.2.1.9.

4.2.2 Transitional surfaces

Note: *The purpose of the transitional surfaces is to establish the airspace to be maintained free from fixed obstacles to protect an aeroplane in the overflight of the runway or go-around manoeuvre following a standard 3.0° approach, beyond the approach surface. See Figure 4-1.*

4.2.2.1 Description. Transitional surfaces. A complex surface along and at a specified distance from the runway centre line and part of the side of the approach surface that slopes upwards and outwards to a specified height.

4.2.2.2 Characteristics. The limits of a transitional surface shall comprise:

a) a lower edge beginning on the side of the approach surface at the elevation of the upper edge and extending down the side of the approach surface to the inner edge of the approach surface and from there along a line extending parallel to and at a

specified distance from the runway centre line and its extension, to the end of the strip; and

b) an upper edge located at 60 m above the elevation of the highest threshold of the runway.

4.2.2.3 The elevation of a point on the lower edge shall be:

a) along the side of the approach surface — equal to the elevation of the approach surface at that point; and

b) along the runway centre line and its extension after the threshold — equal to the elevation of the nearest point on the centre line of the runway or its extension.

Note: *As a result of b) the transitional surfaces along the line parallel to the runway centre line will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The upper edge of the transitional surfaces will also be a curved or a straight line depending on the runway profile.*

4.2.2.4 The slope of the transitional surfaces shall be measured in a vertical plane perpendicular to the vertical plane containing the runway centre line or its extension.

4.2.2.5 The slope of the transitional surface shall not be greater than 20 per cent.

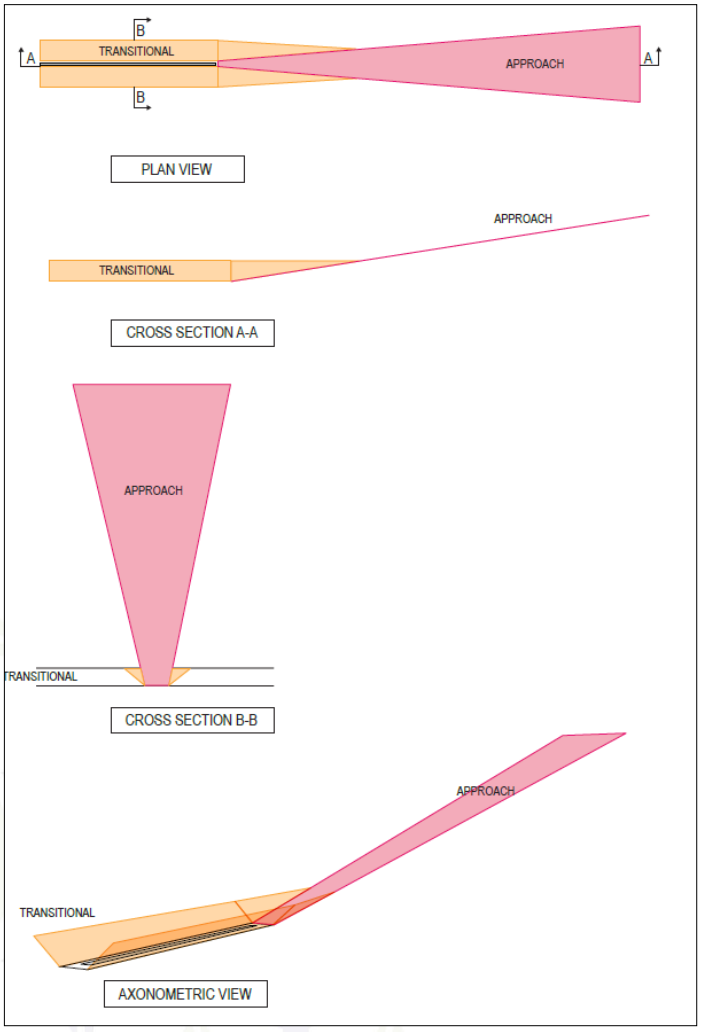


Figure 4-1. Approach surface and transitional surfaces

4.2.3 Inner approach surface

Note: *The inner approach surface protects an aeroplane against fixed and mobile obstacles before the threshold, in the descent phase of the balked landing or late go-around manoeuvres following a standard 3.0° approach. See Figure 4-2 and Figure 4-3.*

4.2.3.1 Description. Inner approach surface. A rectangular portion of the approach surface immediately preceding the threshold.

4.2.3.2 Characteristics. The limits of the inner approach surface shall comprise:

a) an inner edge coincident with the location of the inner edge of the approach surface but of its own specified length;

b) two sides originating at the ends of the inner edge and extending parallel to the vertical plane containing the centre line of the runway; and

c) an outer edge parallel to the inner edge.

4.2.3.3 The surface mentioned in 4.2.3.2 shall be varied when lateral offset, angular offset or curved approaches are utilized; two sides originating at the ends of the inner edge and extending parallel to the extended centre line of the lateral offset, angular offset or curved ground track.

4.2.3.4 The dimensions of the inner approach surface for non-instrument runway shall not be less than those specified in Table 4-3.

4.2.3.5 The dimensions of the inner approach surface for non-precision approach runway shall not be less than those specified in Table 4-4.

4.2.3.6 The dimensions of the inner approach surface for precision approach runway shall not be less than those specified in Table 4-5.

4.2.3.7 If the slope of the approach surface is reduced, the length of the inner approach surface shall be increased to provide protection to a height of 45 m (150 ft).

Table 4-3. Dimensions of inner approach surface — Non-instrument runways

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Length of inner edge	60 m	80 m	100 m	110 m	120 m	120 m[a]
Length	900 m[b]	1 125 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]
[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre. [b] See 4.2.3.7.						

Table 4-4. Dimensions of inner approach surface — Non-precision approach runways

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Length of inner edge	80 m	80 m	120 m	120 m	120 m	120 m[a]
Length	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]

[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre. [b] See 4.2.3.7.

Table 4-5. Dimensions of inner approach surface — Precision approach runways

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Length of inner edge	90 m	90 m	120 m	120 m	120 m	120 m[a]
Length	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]	1 350 m[b]
[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre. [b] See 4.2.3.7.						

4.2.4 Inner transitional surfaces

Note: *The inner transitional surfaces aim at establishing the airspace to be maintained free from fixed and mobile obstacles to protect an aeroplane in the climb phase of the balked landing or late go-around manoeuvres following a standard 3.0° approach, beyond the inner approach surface. See Figure 4-2 and Figure 4-3.*

4.2.4.1 Description. Inner transitional surfaces:

a) Non-instrument and non-precision approach runways — A complex surface at a specified distance from the runway centre line consisting of two successive sections: a first section that rises vertically to a given height, followed by a second inclined section that slopes upwards and outwards to a specified height; and

b) Precision approach runways — A surface similar to the transitional surface but closer to the runway.

4.2.4.2 Characteristics. On non-instrument and non-precision approach runways:

a) the limits of the vertical section of the inner transitional surface shall comprise:

1) a lower edge beginning on the side of the inner approach surface at a specified height above the inner edge of that surface, extending down the side of the inner approach surface to its inner edge, from there along a line parallel to and at a specified distance from the runway centre line, and its extension, to a specified length after the threshold and from there, vertically to a specific height; and

2) an upper edge parallel to, and at a specified height above, the runway centre line;

b) the limits of the inclined section of the inner transitional surface shall comprise:

1) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the upper edge of the vertical section, from there along the upper edge of the vertical section; and

2) an upper edge parallel to and at 60 m above the elevation of the highest threshold of the runway.

4.2.4.3 Characteristics. On precision approach runways, the limits of the inner transitional surface shall comprise:

a) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along a line parallel to and at a specified distance from the runway centre line and its extension to the inner edge of the balked landing surface and from there up the side of the balked landing surface to the upper edge; and

b) an upper edge located at 60 m above the elevation of the highest threshold of the runway.

4.2.4.4 On non-instrument and non-precision approach runways, the elevation of a point shall be:

a) on the lower edge of the vertical section:

1) along the side of the inner approach surface — equal to the elevation of the inner approach surface at that point; and

2) after the inner edge of the inner approach surface — equal to the elevation of the nearest point on the centre line of the runway or its extension;

b) on the upper edge of the vertical section — equal to a specific height above the nearest point on the centre line of the runway or its extension;

c) on the lower edge of the inclined section:

1) along the side of the inner approach surface — equal to the elevation of the inner approach surface at that point; and

2) along the upper edge of the lower section — equal to the elevation of the upper edge of the lower section at that point.

Note: *As a result of a), b) and c) the two sections of the inner transitional surfaces along the centre line of the runway will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The upper edges of both sections of the inner transitional surfaces will also be curved or straight lines depending on the runway profile.*

4.2.4.5 On precision approach runways, the elevation of a point on the lower edge shall be:

a) along the side of the inner approach surface and balked landing surface — equal to the elevation of the particular surface at that point; and

b) along the runway centre line and its extension — equal to the elevation of the nearest point on the centre line of the runway or its extension;

Note: *As a result of b) the inner transitional surfaces along the centre line of the runway will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The upper edge of the inner transitional surfaces will also be a curved or a straight line depending on the runway profile.*

4.2.4.6 The slope of the inner transitional surfaces shall be measured:

a) between the inner edges of the inner approach surface and balked landing surface: in a vertical plane perpendicular to the vertical plane containing the runway centre line and its extension;

b) before the inner edge of the inner approach surface:

1) where straight-in approaches are utilized: in a vertical plane perpendicular to the vertical plane containing the runway centre line and its extension; and

2) where lateral offset, angular offset or curved approaches are utilized: along any straight part of the approach, in a vertical plane perpendicular to the vertical plane containing the straight part of the approach or, along any curved part of the approach, in the vertical plane tangent with the curved ground track.

4.2.4.7 The slope of the inner transitional surfaces for non-instrument runway shall not be greater than, and the height of the vertical section not lower than, that specified in Table 4-6.

4.2.4.8 The slope of the inner transitional surfaces for non-precision approach runway shall not be greater than, and the height of the vertical section not lower than, that specified in Table 4-7.

4.2.4.9 The slope of the inner transitional surfaces for precision runway shall not be greater than that specified in Table 4-8.

Table 4-6. Dimensions of inner transitional surfaces — Non-instrument runways

Aeroplane design group	I	IIA-IIB	IIC	III	IV	V
Height of the vertical section	6 m	6 m	8.4 m	10 m	5 m	5 m
Slope of the inclined section	40 %	40 %	33.3%	33.3%	33.3%	33.3%
Length	a	a	1 800 m[b]	1 800 m[b]	1 800 m[b]	1 800 m[b]

[a] To the end of the strip.
[b] Or to the end of the runway, whichever is less.

Table 4-7. Dimensions of inner transitional surfaces — Non-precision approach runways

Aeroplane design group	I	IIA-IIB	IIC	III	IV	V
Height of the vertical section	6 m	6 m	5 m	5 m	5 m	5 m
Slope of the inclined section	40 %	40 %	33.3%	33.3%	33.3%	33.3%
Length	a	a	1 800 m[b]	1 800 m[b]	1 800 m[b]	1 800 m[b]

[a] To the end of the strip.
[b] Or to the end of the runway, whichever is less.

Table 4-8. Slopes of inner transitional surfaces — Precision approach runways

Aeroplane design group	I	IIA-IIB	IIC	III	IV	V
Slope	40 %	40 %	33.3%	33.3%	33.3%	33.3%
Length	a	a	a	a	a	a

[a] See 4.2.4.3.

4.2.5 Balked landing surface

Note: *The balked landing surface is intended to be implemented on precision approach runways, where the balked landing might be initiated at low height above the threshold and the climb phase of the manoeuvre is not necessarily covered by the inner transitional surfaces. The balked landing surface aims at establishing the airspace to be maintained free from fixed and mobile obstacles to protect an aeroplane in the climb phase of the balked landing or late go-around manoeuvres following a standard 3.0° approach, beyond the inner transitional surfaces. See Figure 4-3.*

4.2.5.1 Description. Balked landing surface. An inclined surface located at a specified distance after the threshold, extending between the inner transitional surfaces.

4.2.5.2 Characteristics. The limits of the balked landing surface shall comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance after the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the runway; and

c) an outer edge parallel to the inner edge and located at 60 m above the elevation of the highest threshold of the runway.

4.2.5.3 The elevation of the inner edge shall be equal to the elevation of the nearest point on the runway centre line.

4.2.5.4 The slope of the balked landing surface shall be measured in the vertical plane containing the centre line of the runway and its extension;

4.2.5.5 The slope of the balked landing surface shall not be greater than, and its other dimensions not less than, those specified in Table 4-9.

Table 4-9. Dimensions and slopes of balked landing surface

Aeroplane design group	**I**	**IIA-IIB**	**IIC**	**III**	**IV**	**V**
Distance from threshold	a	a	1 800 m[b]	1 800 m[b]	1 800 m[b]	1 800 m[b]
Length of inner edge	90 m	90 m	120 m	120 m	120 m	120 m[c]
Divergence (each side)	10%	10%	10%	10%	10%	10%
Slope	5%	4%	3.33%	3.33%	3.33%	3.33%

a. End of the strip.
b. Or end of runway whichever is less.
c. The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.

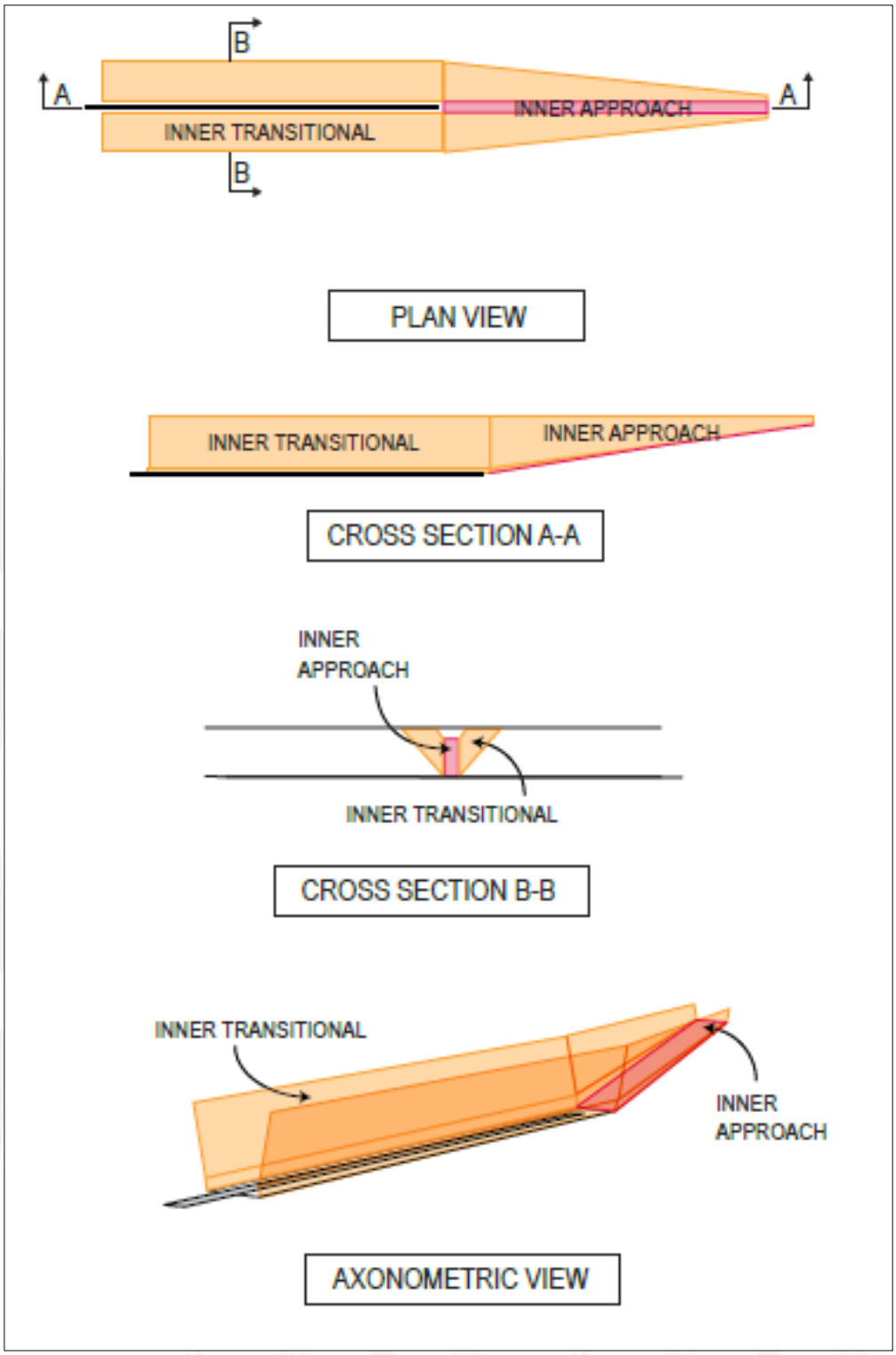


Figure 4-2 Inner approach and inner transitional surfaces on a non-precision approach runway

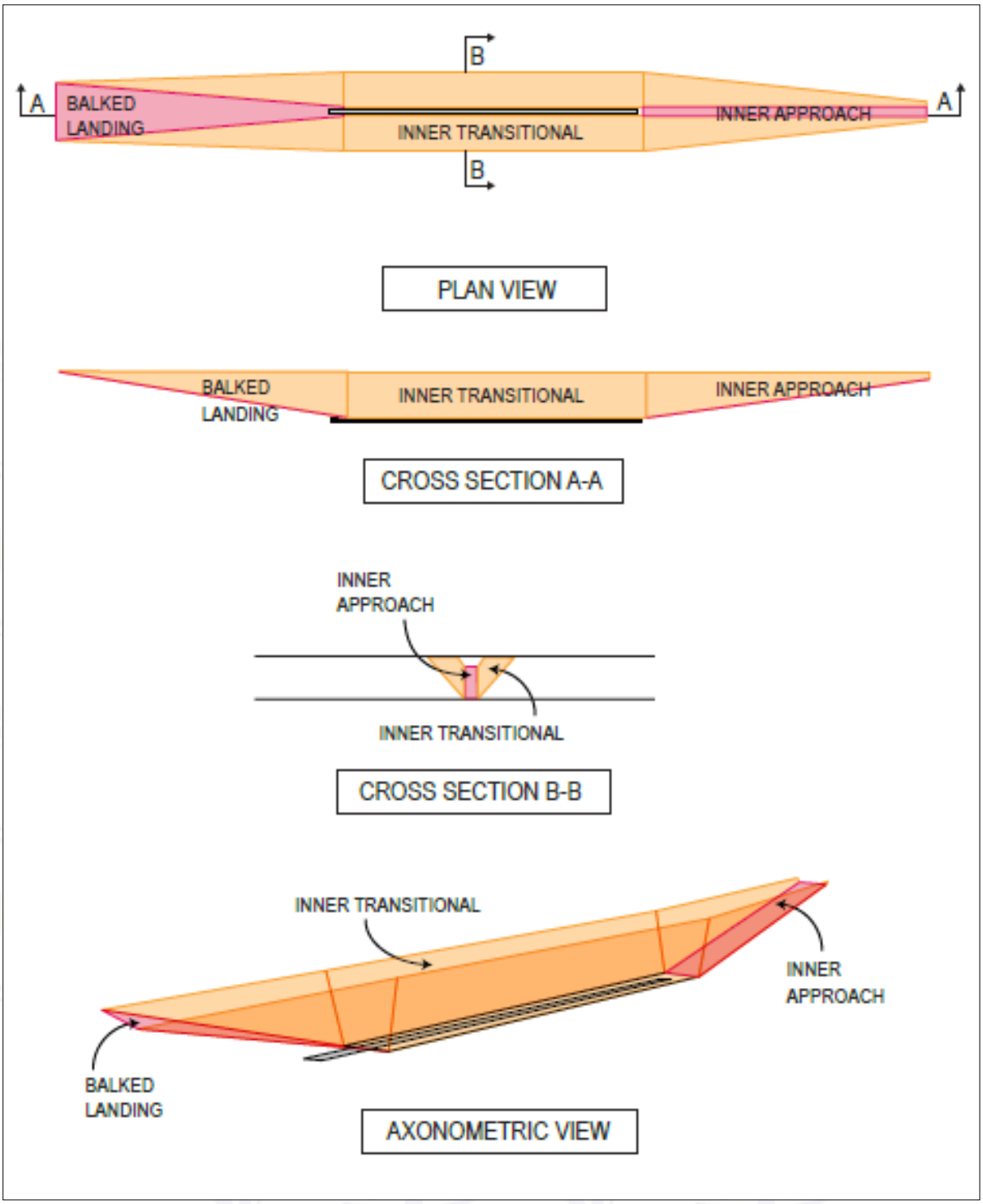


Figure 4-3 Obstacle free zone on a precision approach runway

4.3 Obstacle evaluation surfaces (OES)

Note 1: *The purpose of the obstacle evaluation surfaces is to establish the airspace necessary to determine the acceptability of obstacles by evaluating their impact on existing and/or intended aeroplane operations at an aerodrome. The impact is evaluated on safety, regularity and demand of the operations identified by the Civil Aviation Authority.*

Note 2: *The OES detailed in the following specifications address most common flight operations and operating minima. When the flight operations differ (e.g. variance in alignment, approach slope, approach minima) specific obstacle evaluation surfaces may need to be established. Depending on the flight operations and procedures available at an aerodrome, the OES may have specifications as specified in the following provisions or may be varied to fit the operations at the aerodrome (e.g. in case of increased minima or where circling does not occur on one side of the runway). There will be instances where additional obstacle evaluation surfaces, beyond what are specified in this section, may be required as the OES or its variations do not satisfactorily cover the local aeroplane operations specific to the aerodrome.*

Note 3: *Detailed specifications on the variation of the OES and their design are contained in PANS-Aerodromes (Doc 9981).*

4.3.1 General

4.3.1.1 The Civil Aviation Authority shall establish the obstacle evaluation surfaces specified in 4.5.2 to protect the existing and/or intended aeroplane operations at an aerodrome.

4.3.1.2 The characteristics and dimensions of the obstacle evaluation surfaces shall be in accordance with the provisions contained in 4.3.2 to 4.3.6.

4.3.1.3 Where it is necessary to preserve the accessibility of an aerodrome to existing and planned operations, the provisions applicable to OFS contained in 4.4.4 to 4.4.8 shall apply to the identified obstacle evaluation surface.

Note: *Detailed specifications are contained in PANS-Aerodromes (Doc 9981), Part II, Chapter 10.*

4.3.2 Horizontal surface

Note: *The purpose of the horizontal surface is to protect the airspace for circling procedures. The horizontal surface also provides some protection for visual circuits and terminal instrument flight procedures, including PBN approaches, early turning missed approaches and early turning departures.*
The design of the horizontal surface is consistent with the dimensions of the visual manoeuvring area provided in PANS-OPS, (Doc 8168, Volume II, Part 1, Section 4, Chapter 7).

4.3.2.1 Description. Horizontal surface. A surface, or a combination of surfaces, located in a horizontal plane, or in a series of horizontal planes, above an aerodrome and its environs.

4.3.2.2 Characteristics. The outer limits of the horizontal surface should be circular arcs centred on runway thresholds joined tangentially by straight lines.

4.3.2.3 The height of the horizontal surface shall be measured above the aerodrome elevation.

4.3.2.4 A horizontal surface shall have a radius of not less than, and a height of not greater than, those specified in Table 4-10.

Table 4-10. Dimensions of horizontal surface

Aeroplane design group	I	IIA-IIB	IIC	III	IV	V
Radius	3 350 m	5 350 m	10 750 m	10 750 m	10 750 m	10 750 m
Height	45 m	60 m	90 m	90 m	90 m	90 m

Note: *Where a runway is intended for the operations of aeroplanes of different aeroplane design groups, all the horizontal surfaces specified by the radii and heights associated with these groups are retained and the horizontal surface is composed of multiple surfaces located at different heights above the aerodrome elevation.*

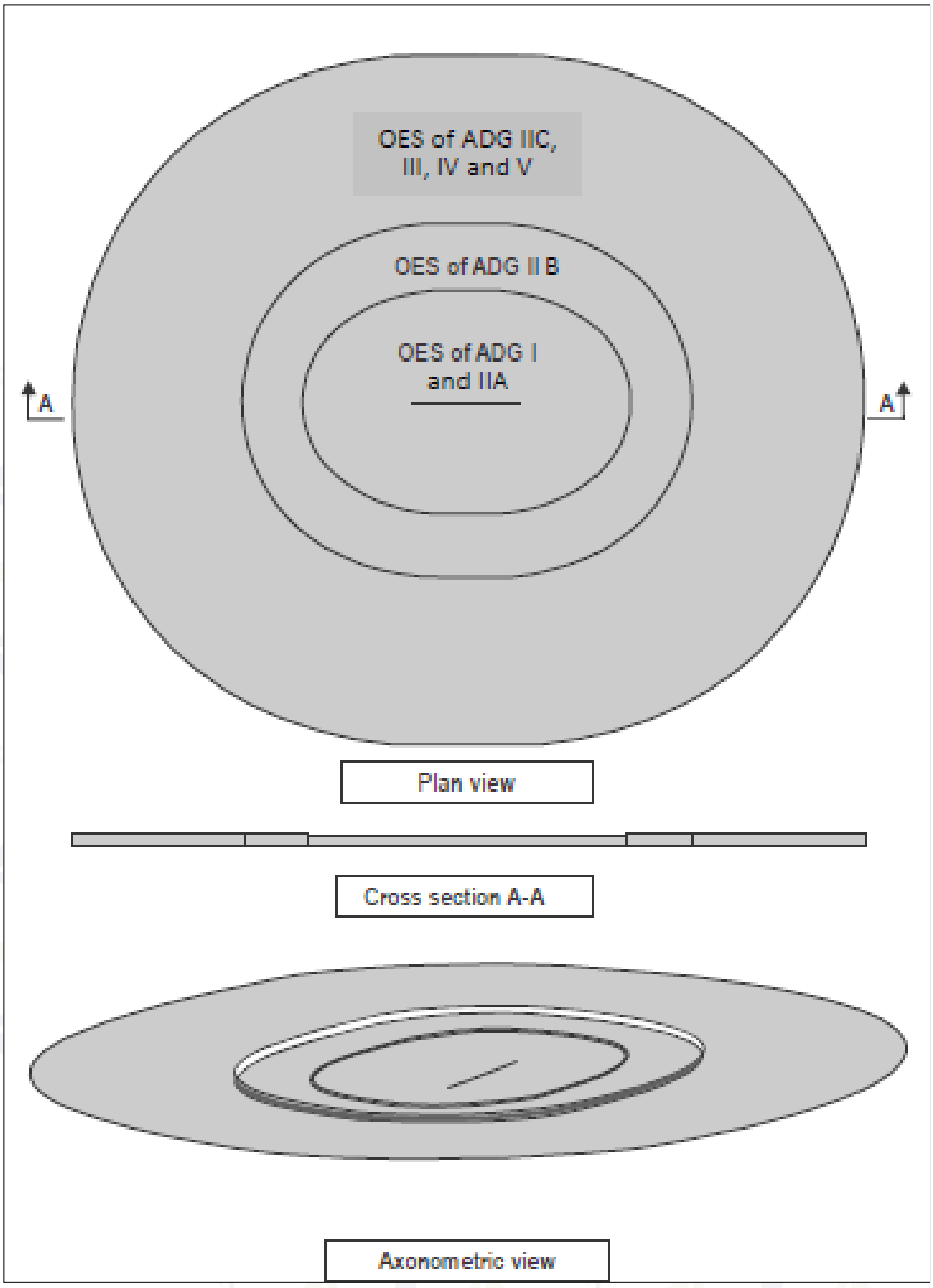


Figure 4-4. Horizontal surface

4.3.3 Surface for straight-in instrument approaches

Note: *The purpose of the surface for straight-in instrument approaches is to establish the airspace where obstacles may have an impact on straight-in instrument approaches, where the horizontal surface(s) or parts thereof are not established. As a single obstacle evaluation surface cannot address the variety of all possible instrument approach procedures, only most common straight-in instrument approaches other than precision approaches are considered. The surfaces for precision approaches are established in 4.3.4.*

4.3.3.1 Description. Surface for straight-in instrument approaches. A combination of surfaces, located in a series of horizontal planes above an aerodrome and its environs.

4.3.3.2 Characteristics. The surface for straight-in instrument approaches should consist of:

a) a lower part corresponding to the horizontal surface applicable to ADG I;

b) an upper part corresponding to that part of the horizontal surface applicable to ADG II and III extending beyond the lateral limit of the lower section and delineated by the rectangle of following sides:

1) two shorter sides perpendicular to and centred on the runway centre line and its extension; and

2) two longer sides extending parallel to the runway centre line and its extension from a given distance before and after the thresholds of the runway.

Note: *The characteristics of the surface for straight-in instrument approaches specified in 4.3.3.2 are applicable to all ADGs.*

4.3.3.3 The heights of the lower section and upper section shall be measured above the aerodrome elevation.

4.3.3.4 The heights of the surface for straight-in instrument approaches shall not be greater than, and its other dimensions not less than, those specified in Table 4-11.

Table 4-11. Dimensions of surface for straight-in instrument approaches

	Aeroplane design group	I to V
Lower section	**Height**	45 m
	Length	Horizontal OES as per ADG I
Upper section	**Height**	60 m
	Length of shorter side	7 410 m
	Length of longer side from the threshold or thresholds	5 350 m

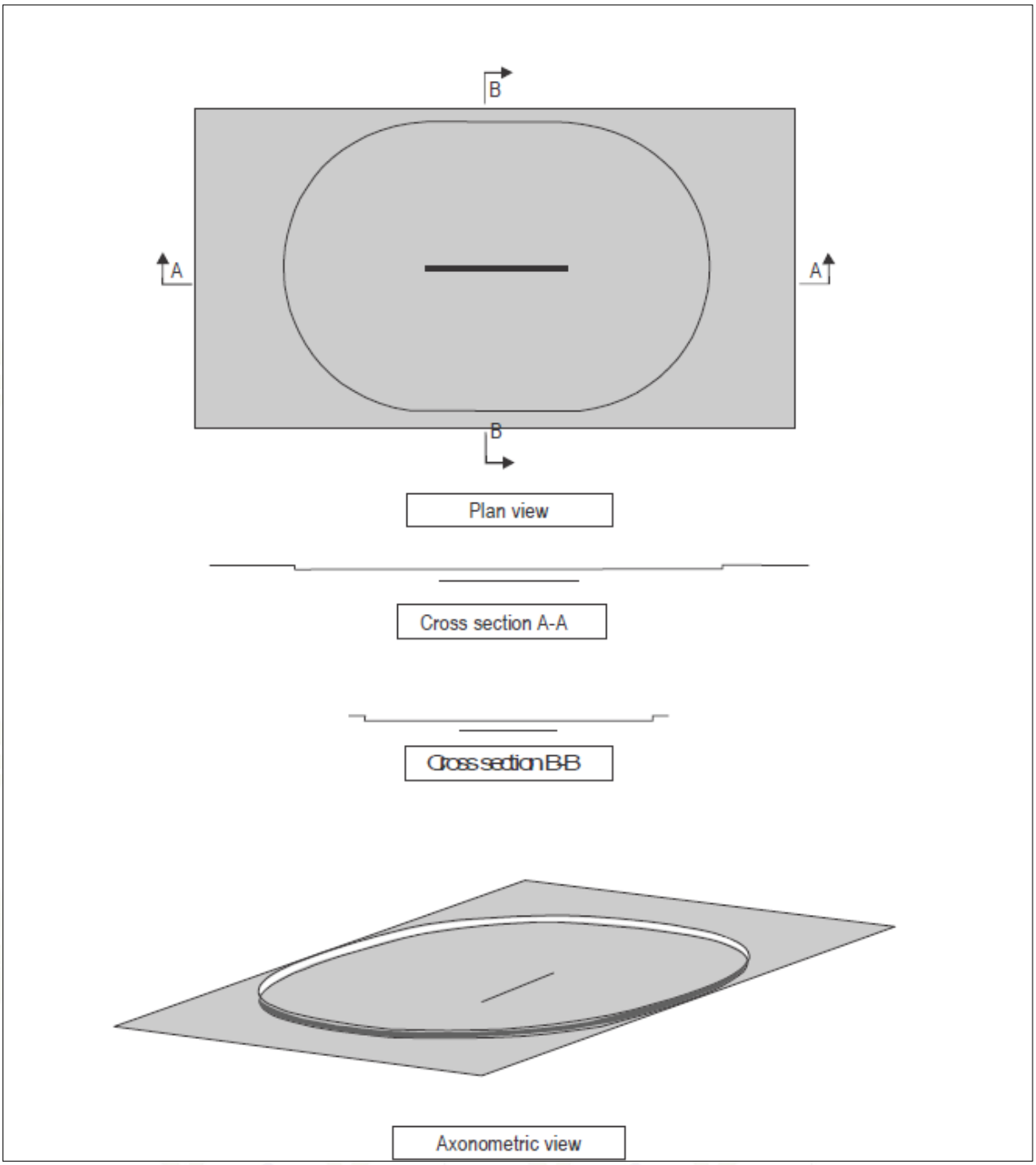


Figure 4-5. Surface for straight-in instrument approaches

4.3.4 Surface for precision approaches

Note: *The purpose of the surface for precision approaches is to establish the airspace where obstacles may have an impact on common straight-in precision approach procedures (using ILS or MLS, ground based augmentation system (GBAS) or satellite-based augmentation system (SBAS) CAT I). The design of the surface is consistent with the dimensions of the basic ILS surfaces provided in PANS-OPS (Doc 8186) Volume II, Part II, Section I, Chapter 1. Adjustments to the surface may be necessary in case of offset procedures.*

4.3.4.1 Description. Surface for precision approaches. A complex surface composed of:

a) an approach component consisting of an inclined surface preceding the threshold;

b) a missed approach component consisting of an inclined surface located at a specific distance after the threshold;

c) transitional components consisting of complex surfaces at a specified distance from the runway centre line and along the approach component and missed approach component, that slopes upwards and outwards; and

d) a lower component specified by a rectangular surface within the inner edges of the above components.

Note: *The transitional components consist of a pair of surfaces, located on either side of the runway centre line. Each surface of this pair is called a transitional component.*

4.3.4.2 Characteristics. The limits of the approach component of the surface for precision approaches should comprise:

a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the approach component; and

c) an outer edge parallel to the inner edge.

4.3.4.3 The elevation of the inner edge of the approach component shall be equal to the elevation of the midpoint of the threshold.

4.3.4.4 The slope of the approach component shall be measured in the vertical plane containing the centre line of the runway and its extension.

4.3.4.5 Characteristics. The limits of the missed approach component of surface for precision approaches should comprise:

a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance after the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the missed approach component; and

c) an outer edge parallel to the inner edge.

4.3.4.6 The elevation of the inner edge of the missed approach component shall be equal to the elevation of the midpoint of the threshold.

Note: *In some cases, the inner edge of the missed approach component may be below the elevation of the midpoint of the threshold, for example where runways slope upward.*

4.3.4.7 The slope of the missed approach component shall be measured in the vertical plane containing the centre line of the runway and its extension.

4.3.4.8 The limits of the transitional component of the surface for precision approaches should comprise:

a) a lower edge beginning on the side of the approach component at the elevation of the upper edge and extending down the side of the approach component to the inner edge of the approach component, from there along a line extending horizontally to the inner edge of the missed approach component, and from there extending up the side of the missed approach component to the upper edge; and

b) an upper edge located at 300 m above the threshold elevation.

4.3.4.9 The elevation of a point on the lower edge of the transitional component shall be:

a) along the side of the approach component and missed approach component — equal to the elevation of the particular surface at that point; and

b) between the inner edges of the approach component and missed approach component — equal to the elevation of the midpoint of the threshold.

Note: *In some cases, the lower edge of the transitional component may be below the elevation of the midpoint of the threshold, for example where runways slope upward.*

4.3.4.10 The slope of the transitional component shall be measured in the vertical plane perpendicular to the centre line of the runway and its extension.

4.3.4.11 Characteristics. The limits of the lower component of the surface for precision approaches should comprise:

a) two shorter sides corresponding with the inner edge of the approach component and missed approach component; and

b) two longer sides corresponding with the inner edges of the transitional components.

4.3.4.12 The elevation of a point on the lower component shall be equal to the elevation of the midpoint of the threshold.

4.3.4.13 The slopes of the different components of the surface for precision approach runways shall not be greater than, and their other dimensions not less than, those specified in Table 4-12.

Table 4-12. Dimensions of surface for precision approaches

	Aeroplane design group		I to V
Approach component		Distance from threshold	60 m
		Length of inner edge	300 m
	1st section	Length	3 000 m
		Divergence (each side)	15 %
		Slope	2 %
	2nd section	Length	9 600 m
		Divergence (each side)	15 %
		Slope	2.5 %
Missed approach component		Distance after threshold	900 m
		Length of inner edge	300 m
	1st section	Length	1 800 m
		Divergence (each side)	17.48 %
		Slope	2.5 %
	2nd section	Length	10 200 m
		Divergence (each side)	25 %
		Slope	2.5 %
Transitional component		Slope	14.3 %

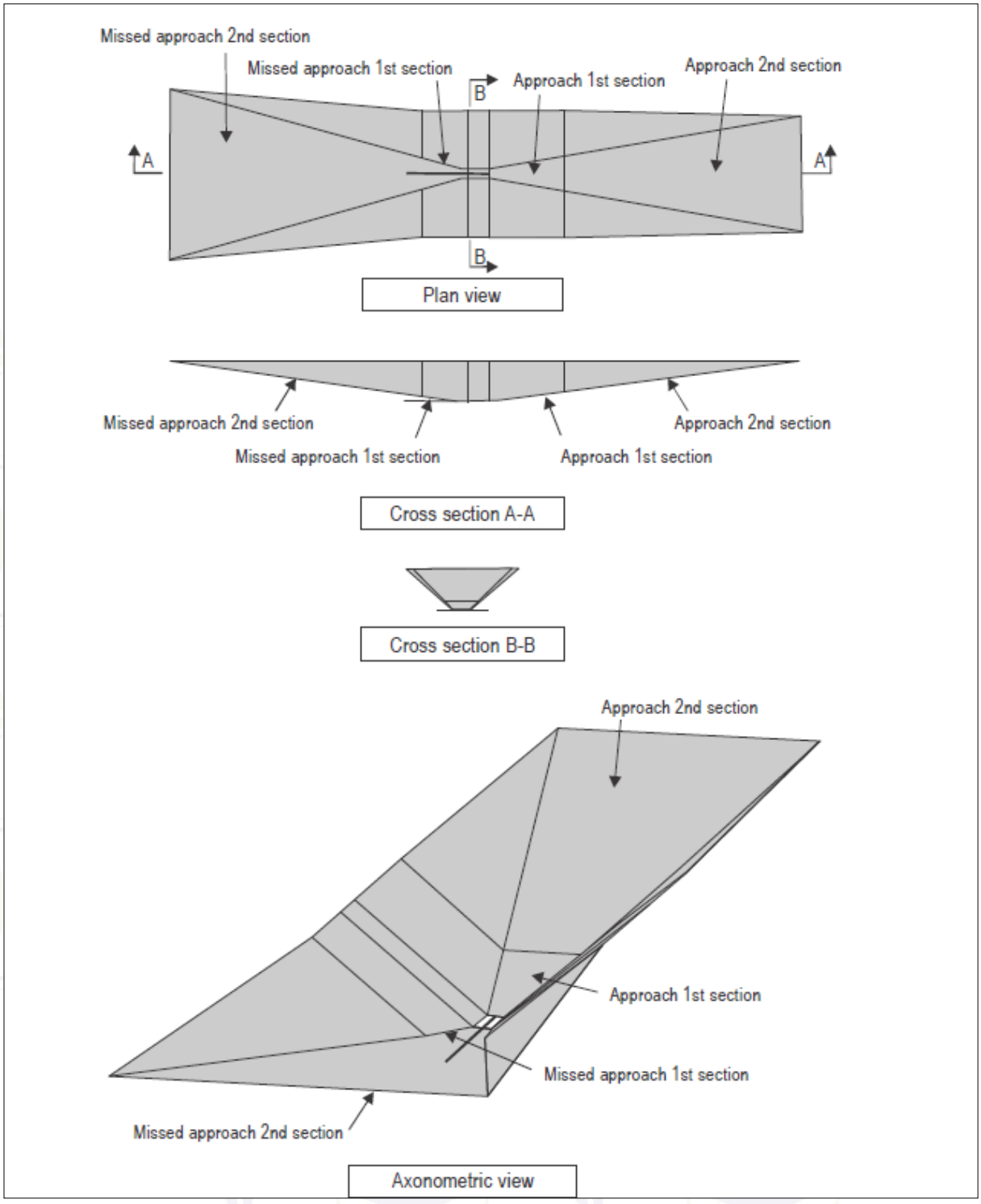


Figure 4-6. Surface for precision approaches

4.3.5 Instrument departure surface

Note: *The purpose of the instrument departure surface is to establish the airspace where obstacles may have an impact on aircraft following an omnidirectional instrument departure procedure. The design of the instrument departure surface is consistent with the dimensions provided in PANS-OPS (Doc 8168, Volume II, Part I, Section 3, Chapter 4).*

4.3.5.1 Description. Instrument departure surface. An inclined surface, along the runway centre line and its extension after the end of the take-off distance available.

4.3.5.2 Characteristics. The limits of the instrument departure surface should comprise:

a) an inner edge of specified length, horizontal and perpendicular to the centre line of the runway and located at the end of the take-off distance available;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the instrument departure surface; and

c) an outer edge parallel to the inner edge.

4.3.5.3 The elevation of the inner edge shall be 5 m above the elevation of the runway centre line and its extension at the end of the take-off distance available.

4.3.5.4 The slope of the instrument departure surface shall be measured in the vertical plane containing the centre line of the runway and its extension.

4.3.5.5 The slope of the instrument departure surface shall not be greater than, and its other dimensions not less than, those specified in Table 4-13.

	Aeroplane design group	**I to V**
	Length of inner edge	300 m
	Slope	2.5 %
First section	**Length**	3 500 m
	Divergence	26.8 %
Second section	**Length**	8 300 m
	Divergence	57.8 %

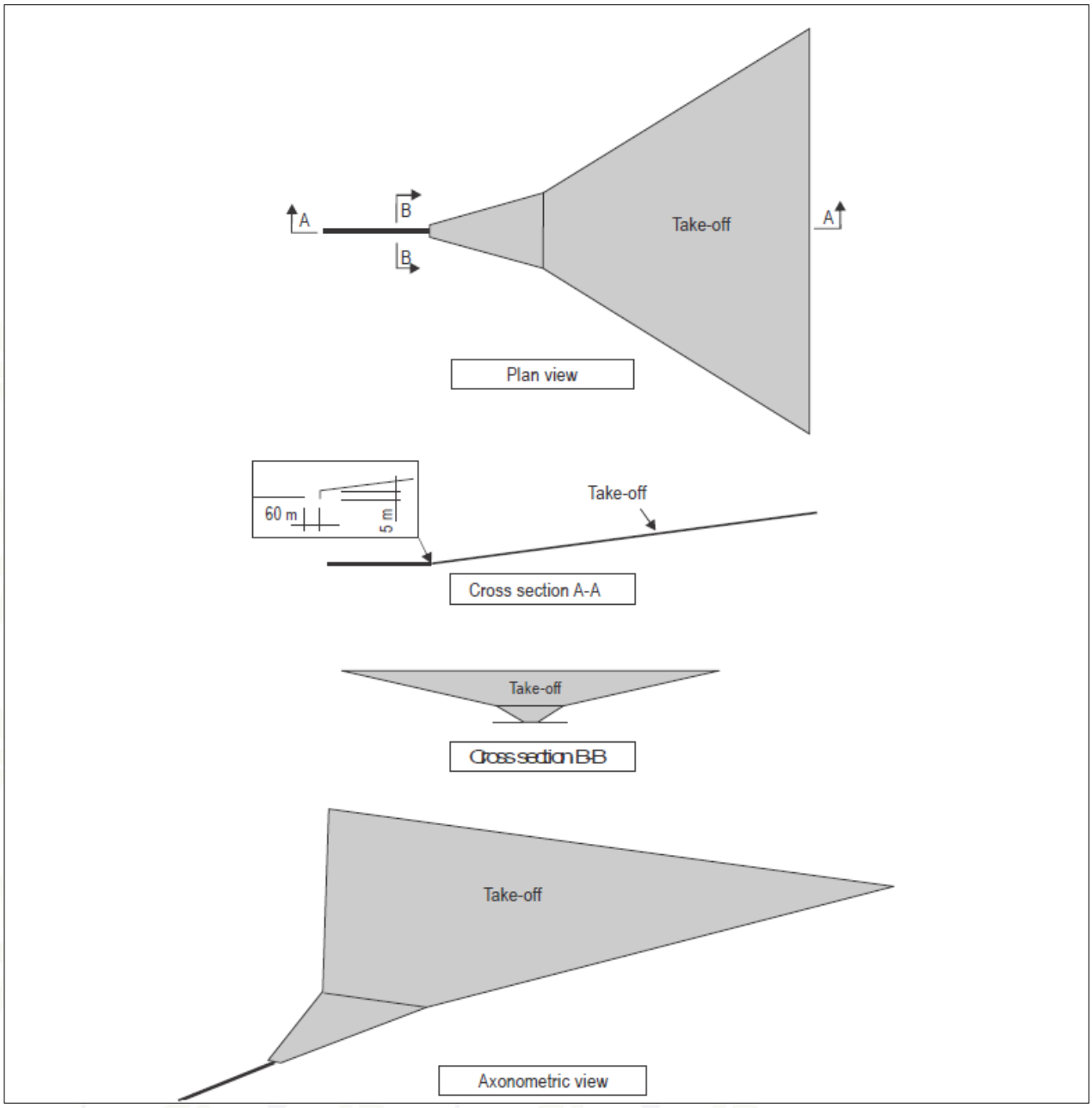


Figure 4-7. Instrument departure surface

4.3.6 Take-off climb surface

Note 1: *The purpose of the take-off climb surface is to establish the airspace where obstacles may have an impact on aircraft operating limitations during take-off under non-critical operating conditions.*

The design of the take-off climb surface is consistent with the take-off obstacle clearance limitations provided in the Aeroplane Performance Manual *(Doc 10064, Chapter 3), and Annex 6, Part I.*

Note 2: *Obstacles that have no impact on aircraft operating limitations during take-off under non-critical operating conditions could have an impact in case of engine failure or abnormal (e.g. extreme weather conditions) and emergency situations (e.g. system failure).*

4.3.6.1 Description. Take-off climb surface. An inclined surface beyond the end of the take-off distance available.

4.3.6.2 Characteristics. The limits of the take-off climb surface should comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance beyond the end of the runway or at the end of the take-off distance available;

b) two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the take-off ground track to a specified final width and continuing thereafter at that width for the remainder of the length of the take-off climb surface; and

c) an outer edge horizontal and perpendicular to the specified take-off track.

4.3.6.3 The above surface shall vary when take-off flight paths involving turns are utilized; two sides originating at the end of the inner edge and diverging uniformly at a specified rate from the extended centre line of the take-off ground track to a specified final width, and extending thereafter parallel to the take-off ground track for the remainder of the length of the take-off climb surface.

4.3.6.4 The elevation of the inner edge shall be equal to the highest point on the extended runway centre line between the end of the take-off run available and the inner edge of the take-off climb surface.

4.3.6.5 The slope of the take-off climb surface shall be measured:

a) in the vertical plane containing the centre line of the runway and its extension where straight take-off flight path are utilized;

b) along any straight part of the take-off flight path, in the vertical plane containing the centre line of the take-off flight path or, along any curved part of the take-off flight path, in the vertical plane tangent with the take-off flight path where take-off flight paths involving turns are utilized.

4.3.6.6 On runways intended for operations of aeroplanes with a maximum certificated take-off mass up to 5 700 kg, the slope of the take-off climb surface shall not be greater than, and its other dimensions not less than, those specified in Table4-14, except that:

a) a lesser length should be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes; and

b) a higher slope should be adopted for the take-off climb surface where such slope would be consistent with the operational characteristics of the critical aeroplane operating out of the runway and the local conditions.

4.3.6.7 On runways intended for operations of aeroplanes with a maximum certificated take-off mass greater than 5 700 kg, the slope of the take-off climb surface shall not be greater than, and its other dimensions not less than, those specified in Table 4-15, except that:

a) a lesser length should be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes; and

b) a higher slope should be adopted for the take-off climb surface where such slope would be consistent with the operational characteristics of the critical aeroplane operating out of the runway and the local conditions.

4.3.6.8 The slope of the take-off climb surface shall not be increased to facilitate the growth of obstacles.

Note: *The slope of the take-off climb surface is intended to adapt to the operations of aeroplanes whose climb performances on take-off climb are such that a slope of 2 per cent is not necessary. However, this slope is not intended to be increased to enable the growth of obstacles. Specifications concerning the increase of the slope of the take-off climb surface are contained in* PANS-Aerodromes *(Doc 9981), Part II, Chapter 10.*

4.3.6.9 The operational characteristics of aeroplanes for which the runway is intended shall be examined to see if it is desirable to reduce the slope specified in Table 4-14 and Table 4-15 to 1.6 per cent when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of the take-off climb surface should be made so as to provide protection to a height equal to that reached with the slopes and lengths in Table 4-14 and 4-15.

Table 4-14. Dimensions of take-off climb surface – runways with operations of aeroplanes with a mass up to 5 700 kg

Aeroplane design group	I	IIA-IIB	IIC[a]	III[a]	IV[a]	V[a]
Distance from runway end[b]	30 m	60 m	-	-	-	-
Length of inner edge	60 m	80 m	-	-	-	-
Divergence (each side)	10%	10%	-	-	-	-
Final width	380 m	580 m	-	-	-	-
Length	1 600 m	2 500 m	-	-	-	-
Slope	5%	4%	-	-	-	-

a. Aeroplanes with a mass up to but not including 5 700 kg generally belong to aeroplane design groups I, IIA and IIB.
b. The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.

Table 4-15. Dimensions of take-off climb surface – runways with operations of aeroplanes with a mass above 5 700 kg

Aeroplane design group	I	IIA-IIB	IIC[a]	III[a]	IV[a]	V[a]
Distance from TODA	-	-	-	-	-	-
Length of inner edge	144 m	156 m	156 m	172 m	180 m	180 m
Divergence (each side)	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Final width	1 800 m [a]	1 800 m [a]	1 800 m [a]	1 800 m [a]	1 800 m [a]	1 800 m [a]
Length	10 000 m	10 000 m	10 000 m	10 000 m	10 000 m	10 000 m
Slope	5%	4%	2%	2%	2%	2%

[a] Where given operational conditions and performances are met, the final width can be decreased. Specifications concerning this reduction are contained in the Airport Services Manual (Doc 9137), Part 6.

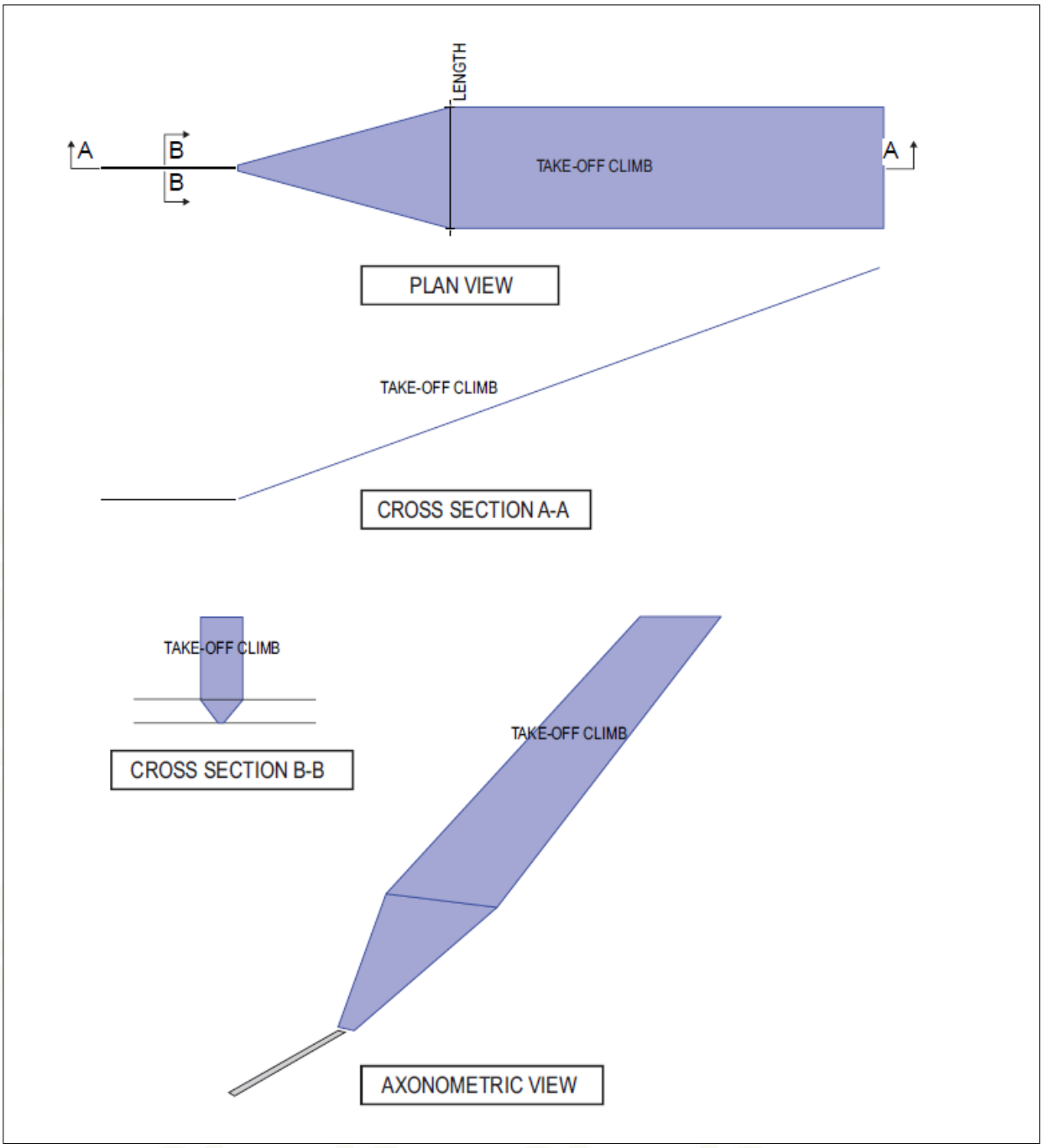


Figure 4-8 Take-off climb surface

4.4 Obstacle limitation requirements

Obstacle free surfaces

4.4.1 Fixed objects shall not be permitted above the inner approach surface, inner transitional surfaces and balked landing surface and that complex surface extending between the lower

edges of the inner transitional surfaces. Visual aids required for air navigation purposes or those objects required for aircraft safety purposes, and which must project into the airspace above the inner approach surface, inner transitional surfaces and balked landing surface or that complex surface extending between the lower edges of the inner transitional surfaces are permitted.

Note: *Specifications concerning objects required for aircraft safety purposes are provided in the Airport Services Manual (Doc 9137), Part 6 – Control of Obstacles. Such objects may for example consist of arresting systems, arresting cables, arresting beds, FOD detection systems, wildlife hazard equipment.*

4.4.2 Visual aids required for air navigation purposes or those fixed objects required for aircraft safety purposes and which project into the airspace above the inner approach surface, inner transitional surfaces and balked landing surface or that complex surface extending between the lower edges of the inner transitional surfaces shall be frangible and mounted as low as possible.

4.4.3 Mobile objects shall not be permitted above the inner approach surface, inner transitional surfaces, balked landing surface and that complex surface extending between the lower edges of the inner transitional surfaces during the use of the runway for landing.

4.4.4 New objects or extensions of existing objects shall not be permitted above the approach surface and transitional surfaces and the complex surface extending between the lower edges of the transitional surfaces. Equipment and installations required for air navigation or for aircraft safety purposes, and which must project into the airspace above the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces are permitted.

4.4.5 Equipment and installations required for air navigation or for aircraft safety purposes and which must project into the airspace above the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces shall be frangible and mounted as low as possible.

4.4.6 Existing obstacles above the approach surface, and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces shall as far as practicable be removed.

4.4.7 The Civil Aviation Authority shall ensure that existing terrain and/or obstacles that cannot be removed and penetrate the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces are only permitted when, after aeronautical study, it is determined that the obstacles do not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

4.4.8 The Civil Aviation Authority shall be advised in case existing terrain and/or obstacles cannot be removed and penetrate the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces, which adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

Note: *Detailed specifications concerning aeronautical study are provided in PANS-Aerodromes (Doc 9981), Part II, Chapter 10.*

Obstacle evaluation surfaces

4.4.9 The Civil Aviation Authority shall ensure that obstacles penetrating the obstacle evaluation surfaces are only permitted when, after aeronautical study, it is determined that the obstacles do not adversely affect the safety or significantly affect the regularity of the existing and intended operations of aeroplanes.

Note*: Detailed specifications concerning aeronautical study is given in PANS-Aerodromes (Doc 9981), Part II, Chapter 10.*

4.5 Obstacle limitation surfaces requirements

Note 1: *The requirements for obstacle free surfaces are specified on the basis of the intended use of a runway and are intended to be applied when such use is made of the runway.*

Note 2: *The requirements for obstacle evaluation surfaces are specified on the basis of the intended use and/or intended operations on the runway. When different obstacle evaluation surfaces overlap each other, each individual surface must be considered as they have specific functions.*

4.5.1 Obstacle free surfaces

4.5.1.1 The following obstacle free surfaces shall be established for a non-instrument or non-precision approach runway:

a) approach surface;
b) transitional surfaces;
c) inner approach surface; and
d) inner transitional surfaces.

4.5.1.2 The following obstacle free surfaces shall be established for a precision approach runway:

a) approach surface;
b) transitional surfaces;

c) inner approach surface;
d) inner transitional surfaces; and
e) balked landing surface.

4.5.2 Obstacle evaluation surfaces

4.5.2.1 The following obstacle evaluation surfaces shall be established:

a) in case of circling approach and/or visual circuits — the horizontal surface specified in 4.3.2 or a specific OES;

b) in case of straight-in instrument approaches other than precision approaches, where the horizontal surface is not established — the surface for straight-in instrument approaches specified in 4.3.3 or a specific OES;

c) in case of precision approach procedure — the surface for precision approaches specified in 4.3.4 or a specific OES;

d) in case of instrument departure procedure — the instrument departure surface specified in 4.3.5 or a specific OES;

e) in case of take-off operations — the take-off climb surface specified in 4.3.6 or a specific OES; and

f) in case of operations different from the above — specific OES.

Note 1: *Operations mentioned in f) may include curved approach, VFR circuit patterns, etc.*

Note 2: *Specifications and further guidance related to specific OES are contained in PANS-Aerodromes (Doc 9981) and in the Airport Services Manual (Doc 9137), Part 6—Control of Obstacles.*

4.6 Objects outside the obstacle free surfaces and obstacle evaluation surfaces

4.6.1 In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 100 m or more above ground elevation shall be regarded as obstacles, unless an aeronautical study indicates that they do not constitute a hazard to the operations of intended aeroplane.

4.6.2 The Civil Aviation Authority (CAA) shall be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by CAA, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.

Chapter 5: Visual Aids for Navigation

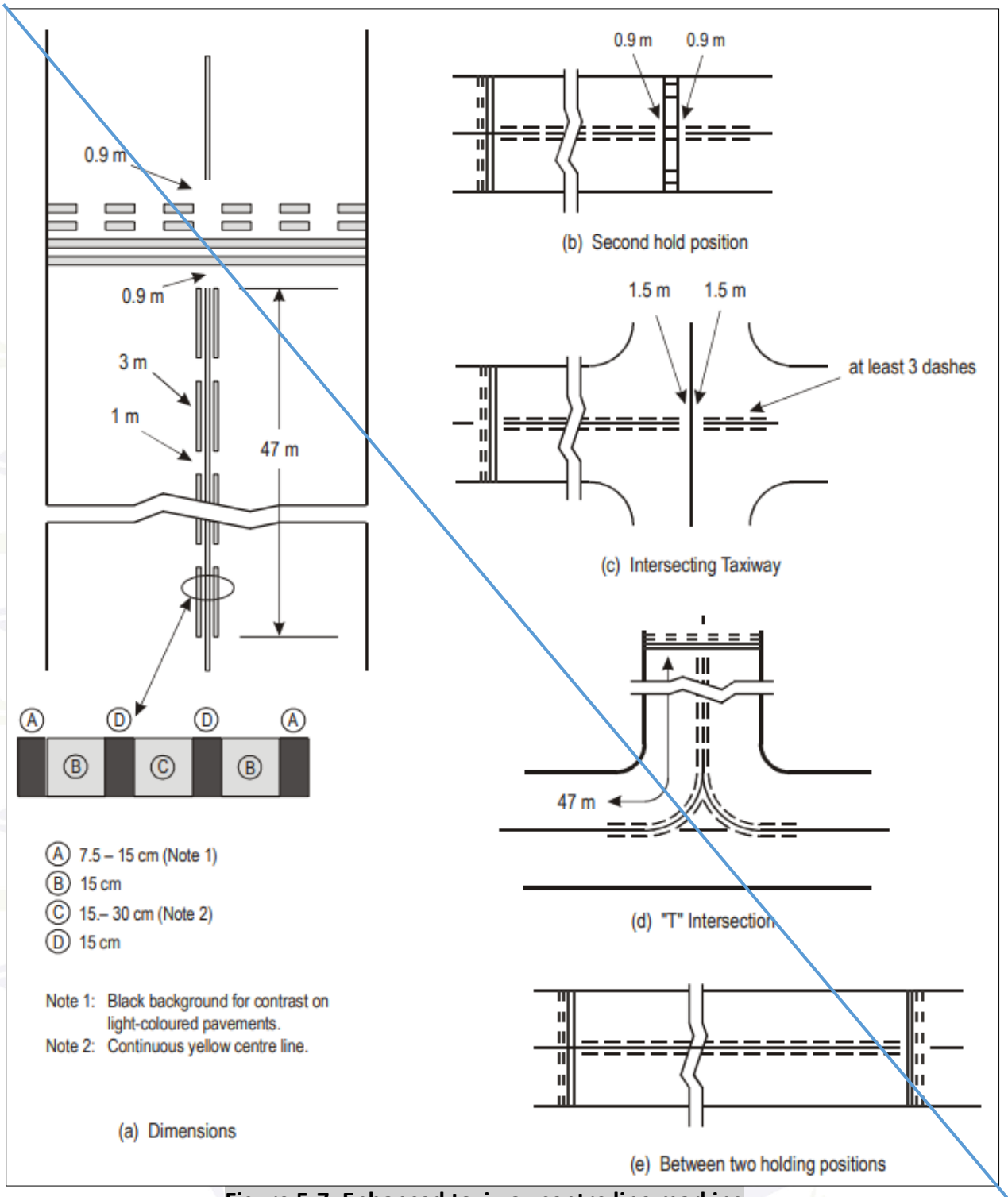
5.3.4 Threshold marking

Application

5.3.4.1 A threshold marking shall be provided at the threshold of a paved ~~instrument~~ runway, ~~and of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by international commercial air transport.~~

~~**5.3.4.2** A threshold marking shall be provided at the threshold of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by other than international commercial air transport.~~

Editorial Note: The below figure has been removed.



~~Figure 5-7. Enhanced taxiway centre line marking~~

Editorial Note: The below figure has been included.

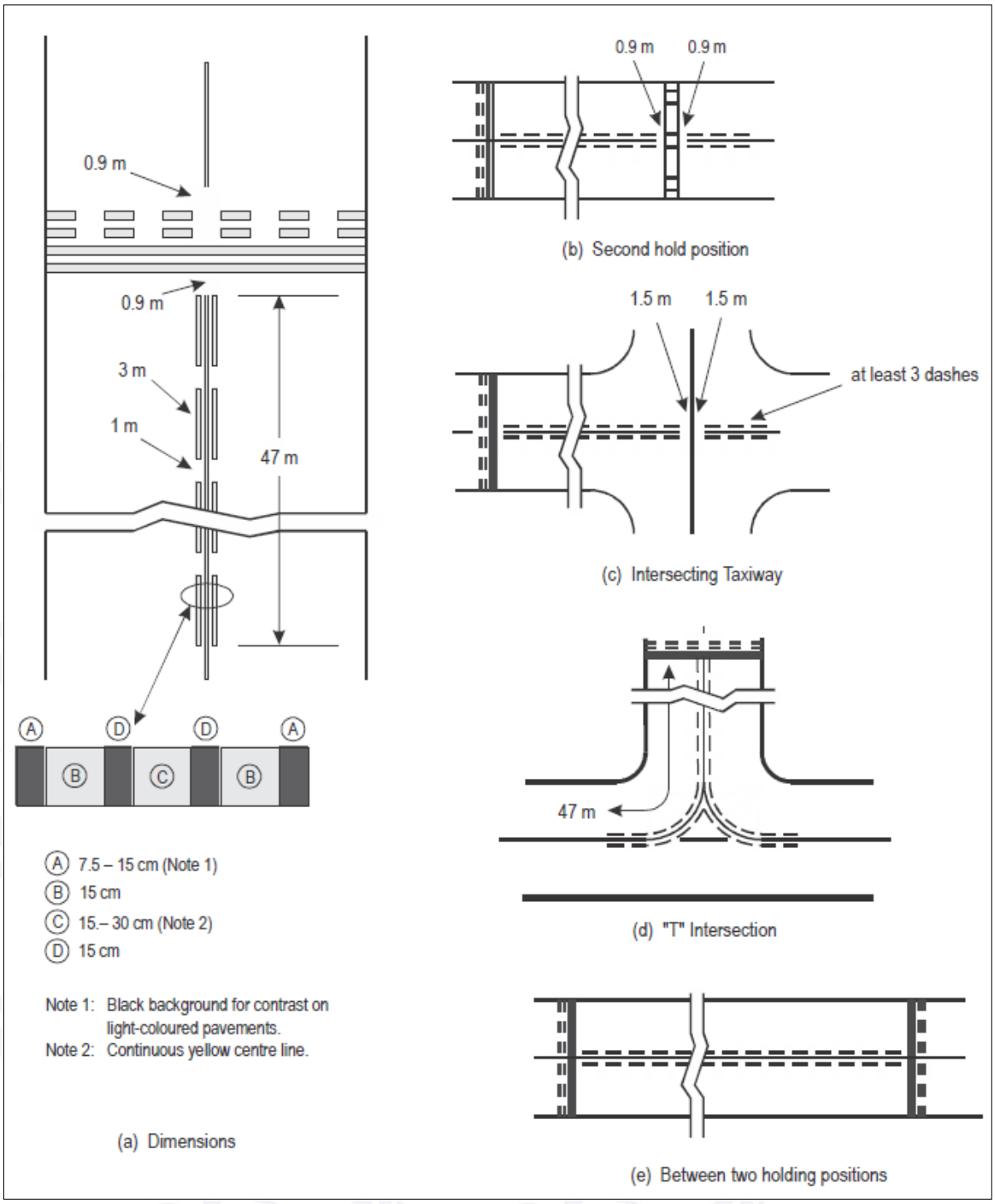


Figure 5-7. Enhanced taxiway centre line marking

5.2.16 Mandatory instruction marking

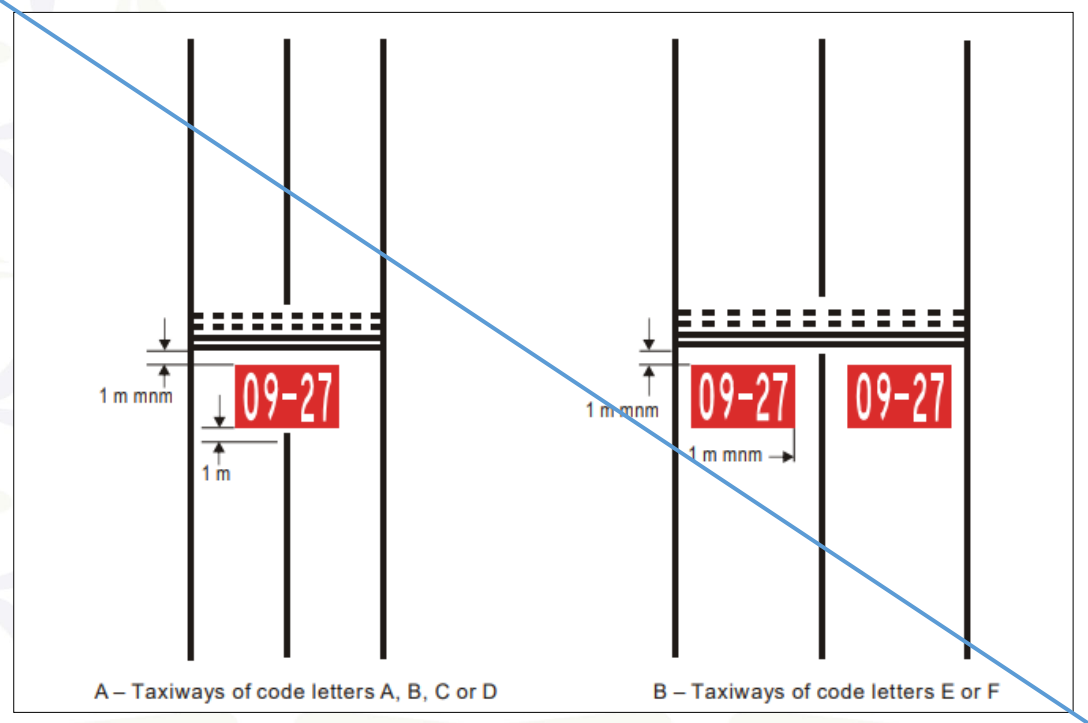
5.2.16.3 The mandatory instruction marking on taxiways where the ~~code letter is A, B, C or D~~ OMGWS is up to but not including 9 m shall be located across the taxiway equally placed about the taxiway center line and on the holding side of the runway-holding position marking as

shown in Figure 5-10 (A). The distance between the nearest edge of the marking and the runway-holding position marking or the taxiway center line marking shall be not less than 1 m.

5.2.16.4 The mandatory instruction marking on taxiways where the ~~code letter is E or F~~ OMGWS from 9 m up to but not including 15 m shall be located on both sides of the taxiway center line marking and on the holding side of the runway-holding position marking as shown in Figure 5-10 (B). The distance between the nearest edge of the marking and the runway-holding position marking or the taxiway center line marking shall be not less than 1 m.

5.2.16.9 The character height shall be 4 m for inscriptions where the OMGWS is from 6 m up to but not including 15 m, ~~code letter is C, D, E or F~~, and 2 m where the ~~code letter is A or B~~. OMGWS is up to but not including 6 m. The inscriptions shall be in the form and proportions shown in Appendix 3.

Editorial Note: The below figure has been deleted.



~~Figure 5-10. Mandatory instruction marking~~

Editorial Note: The below figure has been included.

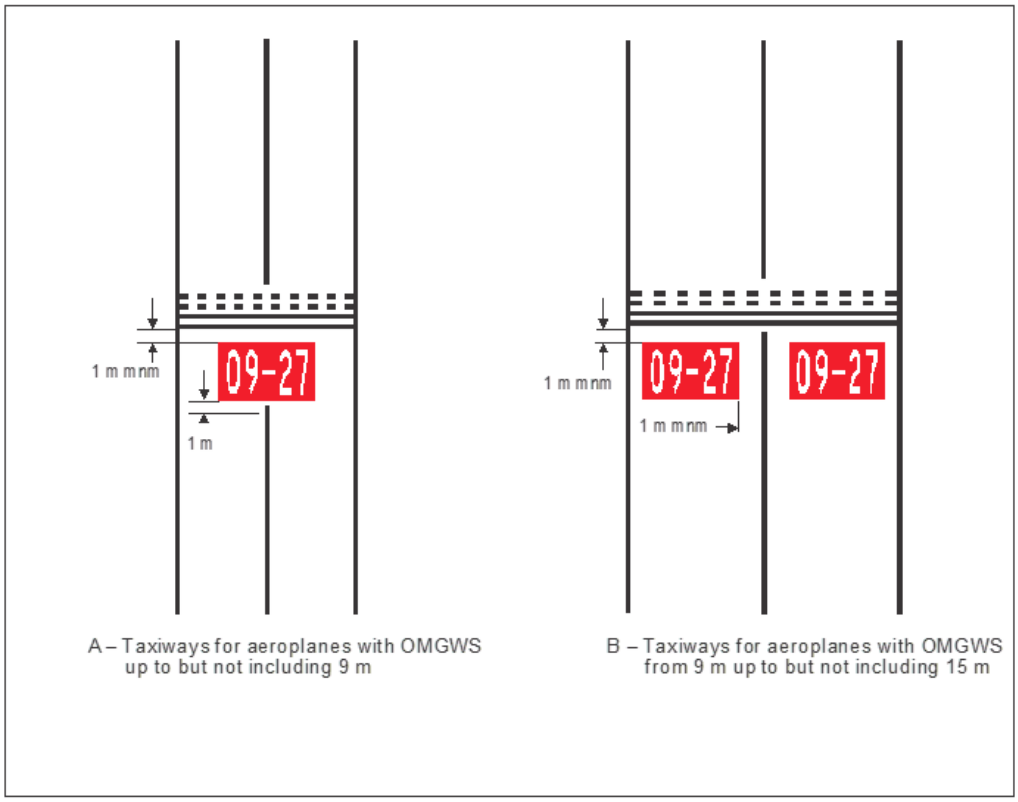


Figure 5-10. Mandatory instruction marking

Light intensity and control

Note: *In dusk or poor visibility conditions by day, lighting can be more effective than marking. For lights to be effective in such conditions or in poor visibility by night, they must be of adequate intensity. To obtain the required intensity, it will usually be necessary to make the light directional, in which case the arcs over which the light shows will have to be adequate and so orientated as to meet the operational requirements. The runway lighting system will have to be considered as a whole, to ensure that the relative light intensities are suitably matched to the same end and are maintained over time. (See Attachment A, Section 15, ~~and~~ on intensity. Guidance on maintenance criteria for aeronautical ground lights and on the use of a site standard is contained in the Aerodrome Design Manual (Doc 9157), Part 4).*

Editorial Note: The below figure has been modified.

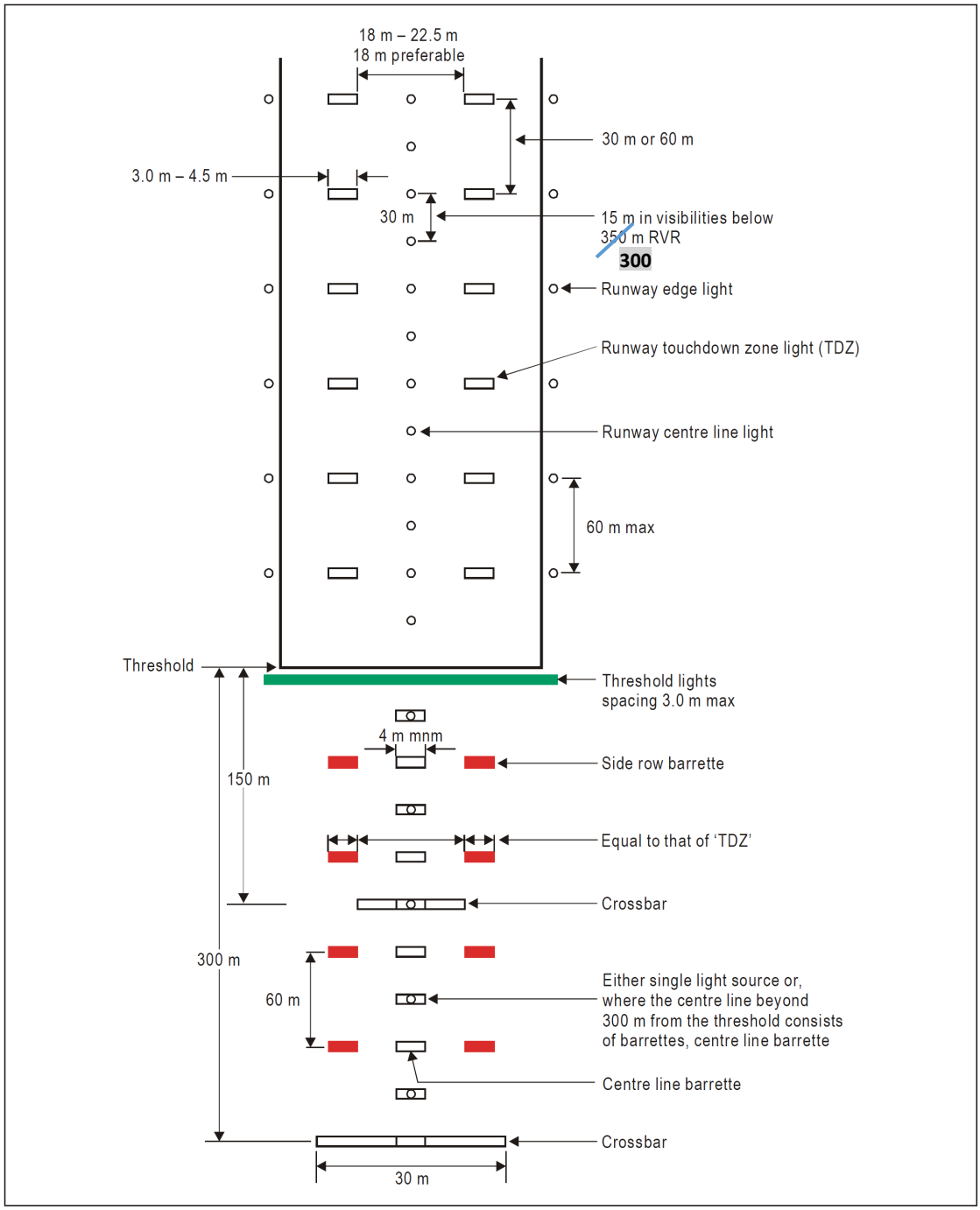


Figure 5-15. Inner 300 m approach and runway lighting for precision approach runways, category II and III, where the serviceability levels of the lights specified as maintenance objectives in Chapter 10 can be demonstrated

5.3.12 Runway center line lights

Location

5.3.12.5 Runway center line lights shall be located along the center line of the runway, except that the lights may be uniformly offset to the same side of the runway center line by not more than 60 cm where it is not practicable to locate them along the center line. The lights shall be located from the threshold to the end at longitudinal spacing of approximately 15 m. Where the serviceability level of the runway center line lights specified as maintenance objectives in 10.5.6 or 10.5.10, as appropriate, can be demonstrated and the runway is intended for use in runway visual range conditions of ~~350~~ 300 m or greater, the longitudinal spacing may be approximately 30 m.

5.3.15 Rapid exit taxiway indicator lights

Application

5.3.15.1 Rapid exit taxiway indicator lights shall be provided on a runway intended for use in runway visual range conditions less than a value of ~~350~~ 300 m and/or where the traffic density is heavy.

5.3.17 Taxiway center line lights

Application

5.3.17.1 Taxiway center line lights shall be provided on an exit taxiway, taxiway, and apron intended for use in runway visual range conditions less than a value of ~~350~~ 300 m in such a manner as to provide continuous guidance between the runway center line and aircraft stands, except that these lights need not be provided where the traffic density is light and taxiway edge lights and center line marking provide adequate guidance.

5.3.17.2 Taxiway centre line lights should be provided on a taxiway intended for use at night in runway visual range conditions of ~~350~~ 300 m or greater, and particularly on complex taxiway intersections and exit taxiways, except that these lights need not be provided where the traffic density is light and taxiway edge lights and center line marking provide adequate guidance.

5.3.17.4 Taxiway center line lights shall be provided on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of ~~350~~ 300 m, except that these lights need not be provided where the traffic density is light and taxiway edge lights and center line marking provide adequate guidance.

5.3.17.9 Taxiway centerline lights shall be in accordance with the specifications of:

a) Appendix 2, Figure A2-12, A2-13, or A2-14, for taxiways intended for use in runway visual range conditions of less than a value of ~~350~~ 300 m; and

b) Appendix 2, Figure A2-15 or A2-16, for other taxiways.

5.3.17.10 Where higher intensities are required, from an operational point of view, taxiway centerline lights on rapid exit taxiways intended for use in runway visual range conditions less than a value of ~~350~~ 300 m shall be in accordance with the specifications of Appendix 2, Figure A2-12. The number of levels of brilliancy settings for these lights shall be the same as that for the runway centerline lights.

Taxiway centerline lights on taxiways

Location

5.3.17.13 Taxiway centerline lights on a straight section of a taxiway shall be spaced at longitudinal intervals of not more than 30 m, except that:

a) Larger intervals not exceeding 60 m may be used where, because of the prevailing meteorological conditions, adequate guidance is provided by such spacing;

b) Intervals less than 30 m shall be provided on short straight sections; and

c) On a taxiway intended for use in RVR conditions of less than a value of ~~350~~ 300 m, the longitudinal spacing shall not exceed 15 m.

5.3.17.15 On a taxiway intended for use in RVR conditions of less than a value of ~~350~~ 300 m, the lights on a curve shall not exceed a spacing of 15 m, and on a curve of less than 400 m radius the lights shall be spaced at intervals of not greater than 7.5 m. This spacing shall extend for 60 m before and after the curve.

Note 1: *Spacings on curves that have been found suitable for a taxiway intended for use in RVR conditions of ~~350~~ 300 m or greater are:*

Taxiway centerline lights on runways

Location

5.3.17.20 Taxiway centerline lights on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of ~~350~~ 300 m shall be spaced at longitudinal intervals not exceeding 15 m.

5.3.19 Runway turn pad lights

Application

5.3.19.1 Runway turn pad lights shall be provided for continuous guidance on a runway turn pad intended for use in runway visual range conditions less than a value of ~~350~~ 300 m, to enable an aeroplane to complete a 180-degree turn and align with the runway centerline.

5.3.21 Intermediate holding position lights

Application

5.3.21.1 Except where a stop bar has been installed, intermediate holding position lights shall be provided at an intermediate holding position intended for use in runway visual range conditions less than a value of ~~350~~ 300 m.

5.3.25 Visual docking guidance system

Application

Note: *The factors to be considered in evaluating the need for a visual docking guidance system are in particular: the number and type(s) of aircraft using the aircraft stand, weather conditions, space available on the apron and the precision required for manoeuvring into the parking position due to aircraft servicing installation, passenger ~~loading~~ boarding bridges, etc. See the Aerodrome Design Manual (Doc 9157), Part 4 — Visual Aids for guidance on the selection of suitable systems.*

5.3.25.6 The accuracy of the system shall be adequate for the type of ~~loading~~ passenger boarding bridge and fixed aircraft servicing installations with which it is to be used.

5.4 Signs

Characteristics

5.4.1.3 Signs shall be frangible. Those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. The installed height of the sign shall not exceed the dimension shown in the appropriate column of Table 5-5, except for runway distance remaining signs (see 5.4.8).

5.4.1.4 ~~Signs~~ Mandatory instruction signs and information signs shall be rectangular, as shown in Figures 5-27 and 5-28 with the longer side horizontal.

5.4.2 Information signs

Note 1: *See Figure 5-28 for pictorial representations of information signs.*

Note 2: *See Chapter 7, 7.4.3 for specifications related to unserviceability signs providing information on operational restrictions and construction works at aerodromes.*

5.4.8 Runway distance remaining signs

Note 1: *The inclusion of detailed specifications for runway distance remaining signs (RDRS) in this section is not intended to imply that an RDRS has to be provided. Attachment A, Section 23, provides guidance on the need to provide RDRSs. Guidance on installing RDRSs is given in the Aerodrome Design Manual (Doc 9157), Part 4.*

Note 2: *Runway excursions may take place in all visibility or weather conditions. The use of RDRS can form part of effective runway excursion prevention measures. The purpose of RDRSs is to provide pilots with distance-to-go information to the extremity of the runway, to enhance situational awareness and enable pilots to decide whether to commence a go-around or to apply braking action for more efficient rollout and runway exit speeds. It is essential that pilots operating at aerodromes with RDRS be familiar with the purpose of these signs.*

Note 3: *Provisions related to the identification of hazards and management of safety risks, including the need for safety risk assessment related to runway safety, is available in PANS-Aerodromes (Doc 9981), Chapter 8.*

Location

5.4.8.1 Where provided, runway distance remaining signs (RDRS) shall be placed along the full length of the runway at longitudinal spacing of approximately 300 m, parallel and equidistant from the runway centre line.

Note: *Displaced threshold areas that are used for take-off and/or roll-out are treated as part of the runway for purposes of locating the signs.*

5.4.8.2 Runway distance remaining signs shall be placed outside the edges of the runway at a distance shown in Table 5-6.

Characteristics

5.4.8.3 Where provided, an RDRS shall consist of an inscription in white on a black background.

5.4.8.4 The installed height of the RDRS shall not exceed the dimension shown in the appropriate column of Table 5-6. All RDRSs on one runway shall be the same size.

Table 5-6. Location distances for runway distance remaining signs

Sign height (mm)	Perpendicular distance from defined runway pavement edge to near side of sign

Code number	Legend	Face (min.)	Installed (max.)	
1 or 2	640	760	1070	6 – 10.5 m
3 or 4	1000	1200	1520	15 – 22.5 m
3 or 4	1200	1500	1600	25 m or more

Chapter 6: Visual Aids for Denoting Obstacles

6.2.2 Mobile Object

Lighting

6.2.2.8 Low-intensity obstacle lights on objects with limited mobility such as passenger boarding ~~aero~~bridges shall be fixed-red, and as a minimum be in accordance with the specifications for low-intensity obstacle lights, Type A, in Table 6-1. The intensity of the lights shall be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general levels of illumination against which they would normally be viewed.

Chapter 7: Visual aids for denoting restricted use areas

7.1.1 General

7.1.1.1 When a runway or taxiway or portion thereof is permanently closed, all normal runway and taxiway markings shall be obliterated.

7.1.1.2 Lighting systems provided for a closed runway or taxiway or portion thereof shall not be operated, except as required for maintenance purposes.

Note: *Lighting systems provided for a runway include both approach and runway lighting systems.*

7.1.1.3 In addition to closed markings, as specified in 7.1.2 and 7.1.3, when ~~the~~ a closed runway or taxiway or portion thereof is intercepted by ~~ausable~~ runway or taxiway which ~~is~~ can be used at night, unserviceability lights shall be placed across the entrance to the closed area at intervals not exceeding 3 m (see 7.4.~~4~~ 2).

7.1.2 Closed runway marking

Application

7.1.2.1 A closed runway marking ~~or elevated illuminated sign~~ shall be displayed on a runway ~~or taxiway~~ or portion thereof which is permanently closed to the use of all aircraft.

7.1.2.2 A closed runway marking ~~or elevated illuminated sign~~ shall be displayed on a temporarily closed runway ~~or taxiway~~ or/portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.

Location

7.1.2.3 ~~On a runway~~ A closed runway marking ~~or elevated illuminated sign~~ shall be placed at each ~~end~~ extremity of the runway, or portion thereof, declared closed, and additional markings shall be so placed that the maximum interval between markings does not exceed 300 m. ~~On a taxiway a closed marking shall be placed at least at each end of the taxiway or portion thereof closed.~~

Characteristics

7.1.2.4 The closed runway marking ~~or elevated illuminated sign~~ shall be white and of the form and proportions as detailed in (Figure 7-1, Illustration a), ~~when displayed on a runway, and shall be of the form and proportions as detailed in (Figure 7-1, Illustration b), when displayed on a taxiway. The marking shall be white when displayed on a runway and shall be yellow when displayed on a taxiway.~~

~~**7.1.5** When a runway or taxiway or portion thereof is permanently closed, all normal runway and taxiway markings shall be obliterated.~~

~~**7.1.6** Lighting on a closed runway or taxiway or portion thereof shall not be operated, except as required for maintenance purposes, and on a permanently closed runway the lighting shall be removed.~~

~~**7.1.7** In addition to closed markings, when the runway or taxiway or portion thereof closed is intercepted by a usable runway or taxiway which is used at night, unserviceability lights shall be placed across the entrance to the closed area at intervals not exceeding 3 m (see 7.4.4).~~

7.1.3 Closed taxiway marking

7.1.3.1 A closed taxiway marking shall be displayed on a ~~runway or~~ taxiway or portion thereof which is permanently closed to the use of all aircraft.

7.1.3.2 A closed taxiway marking shall be displayed on a temporarily closed ~~runway or~~ taxiway or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.

Location

7.1.3.3 ~~On a runway a closed marking shall be placed at each end of the runway, or portion~~

~~thereof, declared closed, and additional markings shall be so placed that the maximum interval between markings does not exceed 300 m. On a~~ A closed taxiway ~~a closed~~ marking shall be placed at least at each ~~end~~ extremity of the taxiway or portion thereof closed.

Characteristics

7.1.3.4 The closed taxiway marking shall be yellow and of the form and proportions as detailed in Figure 7-1, Illustration ~~a~~b)~~.~~, ~~when displayed on a taxiway. The marking shall be white when displayed on a runway and shall be yellow when displayed on a taxiway.~~

7.1.4 Closed runway lighting

Application

7.1.4.1 Where operationally desirable, at an aerodrome provided with runway lighting, closed runway lighting shall be provided on runway (s) that are temporarily closed or temporarily restricted for take-off.

Note 1: *The purpose of the closed runway lighting is to reduce the likelihood of unintended landings during periods of poor visibility or at night whenever the runway lighting must be switched on for electrical maintenance.*

Note 2: *In dusk or poor visibility conditions by day, lighting can be more effective than markings.*

Note 3: *The closed runway lighting is intended to be controlled either automatically or manually by air traffic services or by the aerodrome operator.*

Location

7.1.4.2 A closed runway lighting shall be placed on the centre line near each extremity of the runway temporarily declared closed.

Note: *Placement of a closed runway lighting would enhance the situational awareness of the runway closure to the pilot.*

Characteristics

7.1.4.3 The closed runway lighting as viewed by the pilot shall be of the equivalent elevated form and proportions as detailed in Figure 7-2, showing a minimum of five lights uniformly spaced on each branch, with a minimum interval as specified by Table 7-1.

Table 7-1. Minimum interval between closed runway lights centres

Number of lights per branch	Minimum interval between lights centres

5	1.5 m
7	1.0 m
9	0.8 m

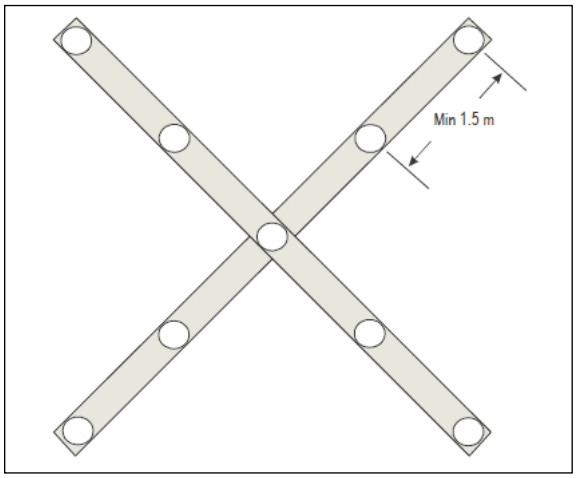


Figure 7-2. Example of equivalent elevated closed runway lighting with five lights per branch

7.1.4.4 Closed runway lights shall show flashing variable white in the direction of approach to the runway, at a rate of one second on and one second off.

7.1.4.5 Closed runway lights shall automatically revert to fixed lights in the event of the flashing system failure.

7.1.4.6 Closed runway lights shall be in accordance with the specifications in Appendix 2, Figure A2-27.

7.4 Unserviceable areas

~~**Application**~~

~~**7.4.1** Unserviceability markers shall be displayed wherever any portion of a taxiway, apron or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely. On a movement area used at night, unserviceability lights shall be used.~~

~~***Note 1:*** *Unserviceability markers and lights are used for such purposes as warning pilots of a hole in a taxiway or apron pavement or outlining a portion of pavement, such as on an apron, that is under repair. They are not suitable for use when a portion of a runway becomes unserviceable, nor on a taxiway when a major portion of the width becomes unserviceable. In such instances, the runway or taxiway is normally closed.*~~

~~***Note 2**: Procedures pertaining to the planning, coordination, monitoring and safety management of works in progress on the movement area are specified in the (AMC CAR 139).*~~

~~**Location**~~

~~**7.4.2** Unserviceability markers and lights shall be placed at intervals sufficiently close so as to delineate the unserviceable area.~~

~~***Note:** Guidance on the location of unserviceability lights is given in Attachment A, Section 14.*~~

~~**Characteristics of unserviceability markers**~~

~~**7.4.3** Unserviceability markers shall consist of conspicuous upstanding devices such as flags, cones or marker boards.~~

~~**Characteristics of unserviceability lights**~~

~~**7.4.4** An unserviceability light shall consist of a red fixed light. The light shall have an intensity sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general level of illumination against which it would normally be viewed. In no case shall the intensity be less than 10 cd of red light.~~

~~**Characteristics of unserviceability cones**~~

~~**7.4.5** An unserviceability cone shall be at least 0.5 m in height and red, orange or yellow or any one of these colours in combination with white.~~

~~**Characteristics of unserviceability flags**~~

~~**7.4.6** An unserviceability flag shall be at least 0.5 m square and red, orange or yellow or any one of these colours in combination with white.~~

~~**Characteristics of unserviceability marker boards**~~

~~**7.4.7** An unserviceability marker board shall be at least 0.5 m in height and 0.9 m in length, with alternate red and white or orange and white vertical stripes.~~

7.4.1 Unserviceability markings

Application

7.4.1.1 Where operationally required, unserviceability signs shall be supplemented by unserviceability markings on the surface of the pavement.

7.4.1.2 Where it is impracticable to install an unserviceability sign in accordance with 7.4.3.1, an unserviceability marking shall be provided on the surface of the pavement.

Location

7.4.1.3 Unserviceability markings shall be displayed across the surface of the taxiway or apron where necessary and positioned so as to be legible from the cockpit of an approaching aircraft.

Characteristics

7.4.1.4 Unserviceability markings shall consist of an inscription in black upon an orange background.

7.4.1.5 The inscriptions shall be in the form and proportions shown in Appendix 3.

7.4.1.6 The background shall be rectangular and extend a minimum of 0.5 m laterally and vertically beyond the extremities of the inscription.

7.4.2 Unserviceability lights

Application

7.4.2.1 Unserviceability markers lights shall be displayed provided on a movement area used at night, wherever any portion of a taxiway, apron or holding bay the movement area is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely. On a movement area used at night, unserviceability lights shall be used.

Note 1: *Unserviceability ~~markers and~~ lights are used for such purposes as warning pilots of a hole in a taxiway or apron pavement or outlining a portion of pavement, such as on an apron, that is under repair. They are not suitable for use when a portion of a runway becomes unserviceable, nor on a taxiway when a major portion of the width becomes unserviceable. In such instances, the runway or taxiway is normally closed.*

Location

7.4.2.2 Unserviceability ~~markers and~~ lights shall be placed at intervals sufficiently close so as to delineate the unserviceable area.

Note: *Guidance on the location of unserviceability lights is given in Attachment A, Section 13.*

~~Characteristics of unserviceability markers~~

~~**7.4.3** Unserviceability markers shall consist of conspicuous upstanding devices such as flags, cones or marker boards.~~

Characteristics ~~of unserviceability lights~~

7.4.2.3 An unserviceability light shall consist of a red fixed light. The light shall have an intensity sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general level of illumination against which it would normally be viewed. In no case shall the intensity be less than 10 cd of red light.

7.4.3 Unserviceability signs

Note 1: *Temporary changes to the movement area may include, inter alia, reduction in the runway length, reduction in the maximum allowable wingspan, taxiway closure or any other closure to the movement area. Unserviceability signs provide relevant information to aerodrome users to maintain an acceptable level of safety during aircraft and vehicle operations, by reducing the risk of confusion and enhancing the awareness of such temporary changes.*

Note 2: *Unserviceability signs can be used to indicate temporary closed or restricted areas, as well as to provide information on operational restrictions to aerodrome users.*

Application

7.4.3.1 Unserviceability signs shall be provided where there is an operational need to indicate temporary changes to runway declared distances.

7.4.3.2 Unserviceability signs shall be provided where there is an operational need to indicate temporary changes to taxiways and aprons.

7.4.3.3 Existing signs shall be removed or obscured at an aerodrome if they provide inadequate or misleading information regarding unserviceability areas.

7.4.3.4 The information provided by unserviceability signs shall not be in conflict with the information provided by the appropriate aeronautical information services.

Note: *The information provided by unserviceability signs supplements that which is provided by the appropriate aeronautical information services unit.*

Location

7.4.3.5 Unserviceability signs shall be located where operationally needed on the movement area. The location distances on the manoeuvring area shall be as per taxiing guidance signs in Table 5 5.

7.4.3.6 The location of unserviceability signs shall not visually obscure or provide conflicting information with existing operationally required visual aids.

Characteristics

7.4.3.7 Unserviceability signs shall be frangible. Those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. The installed height of unserviceability signs shall not exceed the dimension for taxiing guidance signs shown in Table 5-5.

7.4.3.8 Unserviceability signs shall be rectangular, as shown in Figure 7-3, with the longer side horizontal.

7.4.3.9 The inscriptions on an unserviceability sign shall be in accordance with the provisions of Appendix 4.

7.4.3.10 Unserviceability signs shall consist of an inscription in black on an orange background. Unserviceability signs shall be supplemented by a black outline measuring 10 mm in width for runways where the code number is 1 or 2, and 20 mm in width for runways where the code number is 3 or 4.

7.4.3.11 The inscription on an unserviceability sign shall consist of a legible, clear and simple message, only providing the useful and necessary information for the safety of the operation.

***Note*:** *See Figure 7-3 for examples of unserviceability signs.*

7.4.3.12 Unserviceability signs shall be retroreflective in accordance with the provisions of Appendix 4.

7.4.3.13 Where there is a need to enhance the conspicuity of unserviceability signs, they shall be supplemented by two red or yellow simultaneously flashing lights. The intensity and the beam spread of these lights shall be in accordance with the specifications in Appendix 2, Figure A2-24.

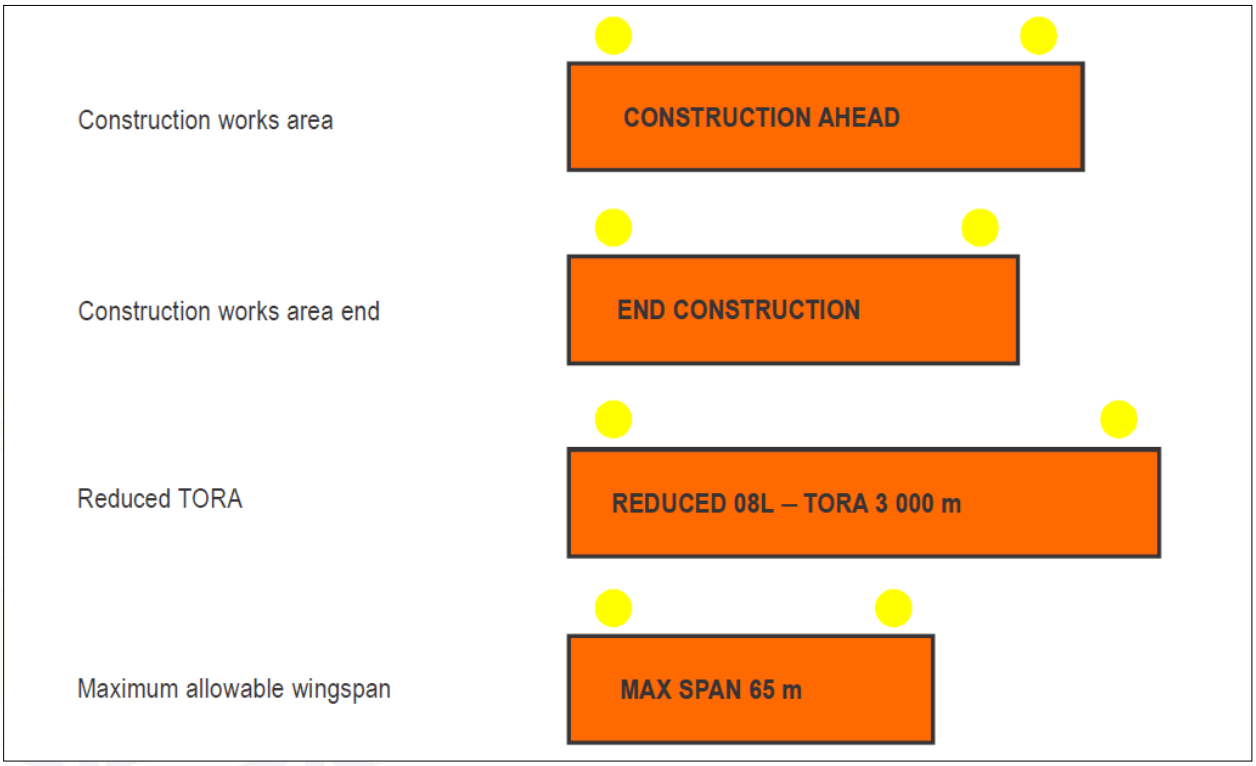


Figure 7-3. Examples of unserviceability signs

7.4.4 Unserviceability markers

Application

7.4.4.1 Unserviceability markers shall be displayed wherever any portion of a taxiway, apron or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely.

Note: *Unserviceability markers are used for such purposes as warning pilots of a hole in a taxiway or apron pavement or outlining a portion of pavement, such as on an apron, that is under repair. They are not suitable for use when a portion of a runway becomes unserviceable, nor on a taxiway when a major portion of the width becomes unserviceable. In such instances, the runway or taxiway is normally closed.*

Location

7.4.4.2 Unserviceability markers shall be placed at intervals sufficiently close, so as to delineate the unserviceable area.

Characteristics

7.4.4.3 Unserviceability markers shall consist of conspicuous upstanding devices such as flags, cones or marker boards.

~~**Characteristics of unserviceability cones**~~

7.4.4.4 An unserviceability cone should be at least 0.5 m in height and red, orange or yellow or any one of these colours in combination with white.

~~**Characteristics of unserviceability flags**~~

7.4.4.5 An unserviceability flag should be at least 0.5 m square and red, orange or yellow or any one of these colours in combination with white.

~~**Characteristics of unserviceability marker boards**~~

7.4.4.6 An unserviceability marker board should be at least 0.5 m in height and 0.9 m in length, with alternate red and white or orange and white vertical stripes.

Chapter 8: Electrical Systems

8.1.10 The following aerodrome facilities shall be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:

c) Approach, runway and taxiway lighting as specified in ~~8.1.6 to~~ 8.1.9;

d) closed runway lighting, if provided in accordance with 7.1.4.1 and connected to the primary power supply.

8.2.4 The electrical systems for the power supply and the control of the closed runway lighting shall be so designed that the closed runway lighting system is operated independently of runway lighting systems.

Chapter 9: Aerodrome Operational Services, Equipment, and Installations

9.1 Aerodrome emergency planning

Note 1: *Examples of agencies are:*

On the aerodrome: air traffic control units, rescue and firefighting services, aerodrome administration, medical and ambulance services, aircraft operators, ground handling service providers, security services, and police;

9.5 Apron management service

9.5.5 Aircraft shall be allocated to an aircraft stand or apron area appropriate to the aircraft characteristics.

9.5.6 A risk assessment shall be carried out if there is a need to allocate aircraft parking to areas other than aircraft stands or apron areas.

Note: *The need to allocate aircraft to other areas could arise from situations such as mass diversions, special events, adverse weather conditions, contingency requirements, work in progress, etc.*

9.5.7 When allocating an aircraft to an aircraft stand, the following parameters shall be considered:

a) parking aids;
b) facilities serving the aircraft stand;
c) proximity of infrastructure;
d) other parked aircraft in the neighbouring aircraft stands;
e) aircraft stand dependencies; and
f) jet blast and propeller wash related protection.

Apron Safety

9.5.9 A vehicle operating on an apron shall:

a) Give way to an emergency vehicle; an aircraft taxiing, about to taxi, or being pushed or towed; and

b) Give way to other vehicles in accordance with local regulations.

9.5.10 Aircraft shall be guided while arriving on or departing from the aircraft stand.

Note: *Means for guidance can be a visual docking guidance systems, personnel, lighting or markings.*

9.5.11 An aircraft stand shall be visually monitored in-person or remotely to ensure that the recommended clearance distances are provided to an aircraft using the stand maintained.
Note: *Stand dependencies may occur when multiple centre lines are used on the same stand, creating possible variations in fixed or mobile obstacle separations with adjacent stands.*

9.5.12 Emergency stop procedures shall be in place to stop an aircraft when entering the stand if the safety of operations on the aircraft stand is compromised.

Note: *Procedures on the training of operational personnel, and on apron safety and operations, are specified in the PANS-Aerodromes (Doc 9981), Part II, Chapters 1 and 7.*

9.5.13 Personnel, other than those required to assist the initial arrival and departure of the aircraft, shall not be allowed to approach the aircraft when anti-collision lights are turned on and engines are running.

9.5.14 Parked aircraft shall be appropriately secured to prevent any unintended movement.

9.6 ~~Ground servicing of aircraft~~ Aircraft fuelling – Safety considerations

9.6.1 Fire extinguishing equipment suitable for at least initial intervention in the event of fuel fire and personnel trained in its use shall be readily available during ~~the ground servicing of an aircraft~~ fueling operations, and there shall be a means of quickly summoning the rescue and firefighting service in the event of a fire or major fuel spill.

9.6.2 When aircraft refueling operations take place while passengers are embarking, on board or disembarking, ground equipment shall be positioned so as to allow:

a) The use of a sufficient number of exits for expeditious evacuation; and

b) A ready escape route from each of the exits to be used in an emergency.

9.7 Ground handling (Applicable as of 26 November 2026)

Note 1: *Ground handling can be provided by an aircraft operator, an aerodrome operator or an independent organization. When provided by an aircraft operator or an aerodrome operator, this organization is also considered, as a ground handling service provider (GHSP).*

Note 2: *A list of ground handling services is provided in the Manual on Ground Handling (Doc 10121), Appendix B.*

9.7.1 The Civil Aviation Authority shall regularly assess the impact of ground handling operations on aviation safety.

Note: *Guidance on the assessment of the impact of ground handling operations on aviation safety is provided in the Manual on Ground Handling (Doc 10121), Chapter 2.*

9.7.2 The Civil Aviation Authority shall establish criteria for the safety oversight of ground handling as part of its State Safety Programme (SSP).

Note 1: *Guidance on the establishment of criteria for the safety oversight of ground handling, and approaches for safety oversight are contained in the Manual on Ground Handling (Doc 10121).*

Note 2: *Provisions on periodically reviewing the need to extend SMS to additional aviation sectors are contained in CAR 100 and Annex 19 – Safety Management. Examples of additional aviation sectors can include GHSP.*

Chapter 10: Aerodrome Maintenance

10.5 Visual aids

10.5.1 ~~The light output of approach, runway and taxiway lighting to meet performance level objectives.~~ A light shall be deemed to be unserviceable when the main beam average intensity is less than 50 per cent of the value specified in the appropriate figure in Appendix 2. ~~For light units where the designed main beam average intensity is above the value shown in Appendix 2, the 50 per cent value shall be related to that design value.~~ For light units where the main beam average intensity is required to be higher than the value specified in the appropriate figure in Appendix 2, a light shall be deemed to be unserviceable when the main beam average intensity value is less than 50 per cent of this higher value and not the value specified in Appendix 2.

Note: *Guidance on maintenance criteria for aeronautical ground lights, on the use of a site standard and on using a higher main beam average intensity is contained in the Aerodrome Design Manual (Doc 9157), Part 4.*

10.5.8 The system of preventive maintenance employed for a stop bar provided at a runway-holding position used in conjunction with a runway intended for operations in runway visual range conditions less than a value of ~~350~~ 300 m shall have the following objectives:

a) No more than two lights will remain unserviceable; and

b) Two adjacent lights will not remain unserviceable unless the light spacing is significantly less than that specified.

10.5.9 The system of preventive maintenance employed for a taxiway intended for use in runway visual range conditions less than a value of ~~350~~ 300 m shall have as its objective that no two adjacent taxiway center line lights be unserviceable.

~~**Chapter 11: Aerodrome certification/operator obligation/use of aerodromes**~~

Editorial Note: This chapter has been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Chapter 12: Particulars to be included in an aerodrome manual~~

Editorial Note: This chapter has been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Chapter 13: Certification of training organizations~~

Editorial Note: This chapter has been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Appendix 6: Acceptable means of compliance & Guidance material on personal requirements~~

Editorial Note: These provisions have been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Attachment C: Application/renewal for aerodrome certificate~~

Editorial Note: These provisions have been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Attachment D: Model form of declaration of compliance~~

Editorial Note: These provisions have been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

~~Attachment F: Application for training organization certificate~~

Editorial Note: These provisions have been removed from this CAR and will be incorporated into a separate Civil Aviation Regulation.

- END -

Attached Comment Response Document

CAR-139 PART I

Aerodrome Certifications, Design and Operation

Stakeholder: Click or tap here to enter text

# ID	CARs Reference	Subject/ Comment (s)	CAA Response
1			☐Not Accepted ☐ Accepted ☐ Partially accepted ☐Noted **Justification (if any):**
2			☐Not Accepted ☐ Accepted ☐ Partially accepted ☐Noted **Justification (if any):**